

Eastman  
(no submitted)

Jacaban2, Evalynne (INFC)

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**From:** SC / VI (INFC)  
**Sent:** March 7, 2019 12:01 PM  
**To:** [REDACTED]  
**Subject:** Smart Cities Challenge - Successful Final Proposal Submission

Dear [REDACTED]

Congratulations! Your submission is ready to move onto evaluation following a completeness check (per the latest FAQs).

Thank you for your cooperation, patience, and hard work, especially during the past eight months. We are truly honoured to have worked with you and wish you the best of luck in the competition!

On a related matter, we have recently determined that it will not be feasible to post final proposals on the Infrastructure Canada website in a timely manner. Instead, we will take an approach similar to the application stage and publish your executive summary in both official languages on the Infrastructure Canada website with a link to the final proposal on your website. We understand that posting the final proposal on your website is not a requirement contained in the finalist guide so we appreciate your cooperation in facilitating access to your final proposal in an open and transparent way. Please note that the accessibility materials you have prepared for your final proposal will still be helpful in preparing various communications products to promote and share knowledge of your work.

Once you have posted your final proposal on your website, please send us the link if you haven't done so already. If you anticipate that you will be unable to post your final proposal on your website within two weeks, please let us know.

As always, we are happy to answer any questions. The best way to reach us going forward would be at our generic account: [infc.sc-vi.infc@canada.ca](mailto:infc.sc-vi.infc@canada.ca).

Thank you.

**Smart Cities Challenge Team**  
Infrastructure Canada  
[infc.sc-vi.infc@canada.ca](mailto:infc.sc-vi.infc@canada.ca)



## COMPLETE CHECK FOR FINAL PROPOSAL

<b>FINALIST:</b> Cree Nation of Eastmain				
<b>ASSESSED BY:</b> Alex Long				
<b>VALIDATED BY:</b> Amanda Aizlewood				
<b>APPROVAL BY:</b> <i>select one: Jenny Tremblay / Eric Poirier</i>				
<b>DATE OF COMPLETION:</b> <i>enter date when all completed boxes are checked</i>				
REQUIREMENTS	COMPLETED	IF NOT COMPLETED, NOTE REASON	GUIDING PRINCIPLES	ACTIONS
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Submitted to <a href="mailto:info@infc.sc-vi.infc@canada.ca">info@infc.sc-vi.infc@canada.ca</a> by 23:59 PST on March 5, 2019	<input checked="" type="checkbox"/>		<ul style="list-style-type: none"> <li>No extensions will be granted</li> <li>No exceptions will be made for lateness or technical problems (finalist must be able to show evidence of submission)</li> </ul>	<ul style="list-style-type: none"> <li># to contact finalist</li> <li>If not resolved, # to flag to DG for decision</li> </ul>
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Organized by these distinct chapters (not limited to these; not necessarily in the same order): <ul style="list-style-type: none"> <li>Vision</li> <li>Performance measurement</li> <li>Project management</li> <li>Technology</li> <li>Governance</li> <li>Engagement</li> <li>Data and privacy</li> <li>Financial</li> <li>Implementation phase requirements</li> </ul>	<input checked="" type="checkbox"/>	List any other chapters if necessary	<ul style="list-style-type: none"> <li>Finalist must have these chapters</li> <li>Finalist can have more chapters</li> <li>Finalist can change the order of the chapters</li> </ul>	<ul style="list-style-type: none"> <li>If the chapters are not clearly labeled, # to do a light analysis of where the content may be and make a note for the Jury</li> </ul>
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Jacaban2, Evalynne (INFC)

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**Subject:** FW: Final Proposal Smart Cities Challenge - Cree Nation of Eastmain / NZE program  
**Attachments:** Final Proposal.pdf; Final Proposal.docx; Annex - PPIA Assessment - Cree Nation of Eastmain.pdf; Annex B - Accessible House Hot2000 Report.pdf; Annex C - Accessible House - Energuide rating sheet.pdf; Annex D - Six Plex - Hot2000 Report.pdf

Resending submission with Annexes A – D.

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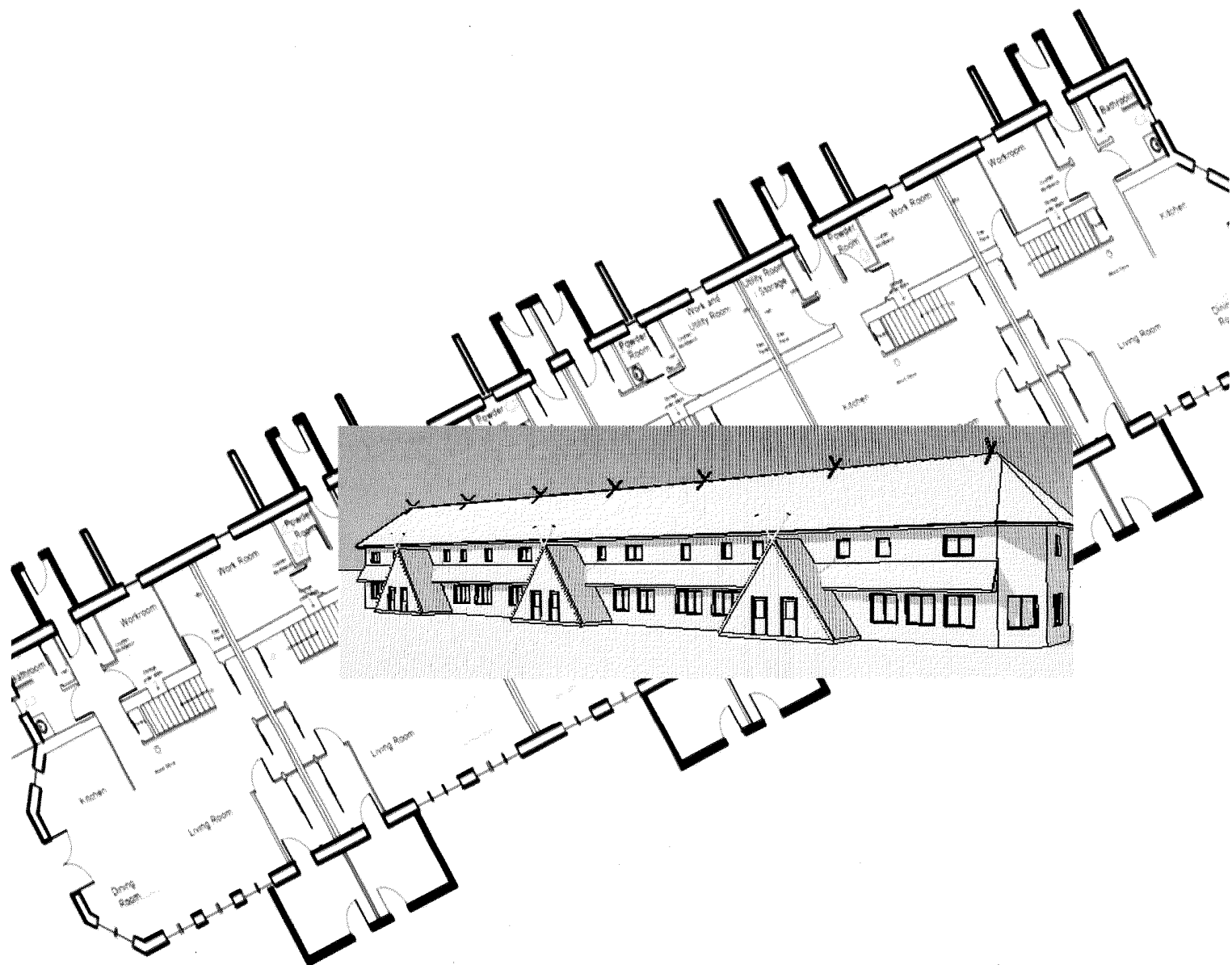
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**THE SMART CITIES CHALLENGE**

**THE CREE NATION OF EASTMAIN'S**

**NET ZERO ENERGY HOUSING PROGRAM**



## EXECUTIVE SUMMARY

**Improving Community well-being.** This statement highlights the challenge that the CNE intends to overcome with its Net-Zero Energy Housing Program.

Housing is essential for a healthy community and, like many Indigenous communities, the CNE has a critical shortage of housing for its members. The lack of adequate housing in Indigenous communities results in overcrowding, a factor in many of the health and social issues inflicting our communities.

In fact, the quality of housing in Indigenous communities has been a hot topic in Canadian news for years, and even recently. The effects of mould and inadequate housing are being linked in the media to serious health conditions and even the deaths of Elders and children. It is clear that housing remains forefront and centre for Canadians, and especially for Indigenous communities.

Through its Net-Zero Energy (NZE) Housing Program, the CNE will construct quality, energy-efficient homes that are affordable for its members. The NZE Housing Program consists of new builds and retrofitting of existing homes. An inventory of single-family homes, an Accessible House and Multi-Client Six-Plexes (Six-Plex) will ensure that housing responds to members' needs and financial capacity.

The CNE vision is clear – create an affordable, resilient, energy-efficient housing program that offers rental and private homeownership opportunities. Substantial performance measurement activities will enable the CNE to determine the success of its NZE program and ensure that milestones and deliverables are on time and on budget.

By establishing an experienced and dedicated project management team, the CNE has been able to develop a comprehensive project implementation plan aimed at achieving success. The CNE will introduce smart technologies and net-zero building techniques to collect quantitative data on the net-zero performance of the houses built and retrofitted under its NZE program. In addition, the CNE will collect qualitative data on residents' housing experiences.

By having a strong, well-established governance system auditable to an ISO/IMS, the CNE will effectively manage program implementation to ensure outcomes are achieved through effective stakeholder engagement, strong leadership and risk-based thinking. The CNE governance framework is grounded in openness, transparency and accountability.

Throughout the development of its NZE program, the CNE has continuously engaged with stakeholders to lead to better decisions and ensure a holistic approach is taken in addressing the housing crisis in Eastmain.

Because of the nature of the NZE program, the CNE will ensure that personal information collected from its members is used, stored and disclosed in accordance with the Personal



Information Protection and Electronic Data Act. Information collected under the NZE program monitoring and research activities will be anonymized prior to any disclosure.

The CNE undertook extensive costing exercises that has already yielded savings for our NZE program. The project management team aggressively sought funding, and will continue to do so, in order to supplement the SCC prize money to ensure the viability of the NZE program with minimum financial risk. The CNE has committed to matching the prize money if selected as the \$5M category winner.

The aforementioned elements are aimed at bringing success and sustainability to the NZE program. Through collaborations with academia, industry experts and government agencies, the CNE is capable of offering not just housing to its members, but a better quality of life. Initiatives like training, work experience and economic development opportunities will ensure a strong and viable future for the community.

Our NZE program was designed around scalability, transferability and replicability. The smart technologies used are commercially available, the governance structure is easily transferable to other Indigenous communities and the house designs and building techniques can be scaled to reflect the financial and technical capacity of other communities, taking into consideration their culture and traditions.

The CNE is an Indigenous community and therefore benefits from obligations generally on the federal Crown and provinces with respect to the duty to consult and modern treaty obligations. At the same time, the CNE has ensured that its NZE program is inclusive and leads to a better quality of life for youth, women, elders and people with disabilities.

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## CHAPTER 1: VISION

### The CNE Vision

The CNE is proud of its heritage. Its vision is that of a self-sufficient First Nation that is able to offer its members, and future generations, a better place to live and grow. This vision is confirmed in the CNE 2018-2021 strategic plan (See Annex A).

Our final proposal pursues the vision of improving the quality of life and well-being of our members and our community by establishing a Net-Zero Energy (NZE) Housing Program to respond to the critical housing shortage. Housing is inarguably the foundation of a strong, healthy community. The lack of adequate housing in Eastmain, and other Indigenous communities, is a significant factor in many of the health and social issues inflicting our communities.

Housing issues are rooted in the history of our communities. The Cree Nation of Eastmain's vision is therefore tied to its past.

Eastmain has evolved from its origins as the Hudson Bay trading post headquarters for the east coast of James Bay. In the early 18<sup>th</sup> century, the Cree people began to settle in the area and the community of Eastmain was established. In 1762, Eastmain was relocated to the south shore of the Eastmain River at the mouth of James Bay to make it more accessible. Notwithstanding the Crees' long occupation of the region and the community, it was only in 1962 that the Lands and Forests Act (RSQ c T-9) reserved the lands for the exclusive use of the Crees of Eastmain.

In the 1960s and 70s, the Crees of James Bay (Eeyou Istchee) joined forces to oppose Quebec's James Bay Hydroelectric Project. From this concerted effort came the first modern day treaty, the James Bay and Northern Quebec Agreement. Since then, the Crees of Eeyou Istchee have entered into a number of other treaties with Canada, Quebec and Hydro Quebec. Most recently, the Agreement on Cree Nation Governance Between the Crees of Eeyou Istchee and the Government of Canada which gives the Cree significant powers of self-government.

Today, Eastmain has a population of approximately 850 people and is the headquarters of the Cree Regional Trappers Association. Much of the economy is based on local and regional government employment, but there are businesses operating in accommodation and food services, retail trade and construction.

Eastmain is therefore a thriving community with strong ties to its traditions.

Initially, like many Indigenous communities, the CNE housing program offered only social housing constructed with federal funding. Housing under this program must be modest and low-cost. However, the housing designs do not satisfy the cultural and social needs of the occupants and the construction techniques relied upon are often not well-suited to northern climates. Consequently, frequent maintenance is needed to ensure the housing units functionality at a cost that undermines their initial affordability.

The social housing model is no longer sustainable and does not allow the CNE to satisfy the ever-growing demand for housing. This model further fails to reflect the economic realities of Eastmain and other Indigenous communities where successful business endeavours, government employment and traditional lifestyles co-exist, creating different levels of financial capacity.

In an effort to move away from this model and find new solutions to the housing shortage, CNE is changing its housing program. By offering other solutions, such as private homeownership and rent-to-own, the CNE can ensure that social housing is allocated to those who have limited financial capacity. The success of these alternatives to social housing depend upon the CNE overcoming the challenge of creating affordable and sustainable housing options.

Consequently, the CNE developed the Net-Zero Energy (NZE) Housing Program. This program addressed the challenge of building affordable housing that is also affordable to operate. Cree Nation of Eastmain's NZE program aims to offer culturally-appropriate designs, significant reductions in operating costs and enhanced resilience and durability while building community capacity and creating new local employment and economic development opportunities.

Since first conceived, the CNENZE program has seen some changes as a result of our ongoing efforts to design a program that is responsive to the CNE housing needs while reflecting our capacity. As a result, the projects in year 1 will be carried out as pilot projects and will be limited to the construction of an Accessible House and the retrofit of an existing house. This variation was driven by (a) restrictions on bulk buying construction materials before storage is available, (b) the start date for local assembly of building components, and (c) to allow for a true inventorying and costing of construction materials required for the NZE program.

It is noteworthy that the NZE program not only responds to regional directives, it also supports the Government of Canada initiative to develop a "net-zero energy ready" building standard and a model code guiding energy efficiency improvements during renovations. Government of Canada intends to have these codes adopted by the provinces and territories by 2030<sup>1</sup>. The Cree Nation of Eastmain's NZE program will put it at the forefront of this initiative, making it an Indigenous leader in addressing the challenges of environmental sustainability and climate change.

## Outcomes

Although housing is but one issue facing Indigenous communities like Eastmain, it is a common underlying factor of many of the social and health issues. Housing that is durable, appealing and comfortable is the foundation of a strong and healthy community which is the Cree Nation of Eastmain's long-term goal. Therefore, the outcome is to establish an inventory of energy-efficient, resilient housing to respond to the needs of its members and

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<sup>1</sup> See: <https://www.canada.ca/en/services/environment/weather/climatechange/climate-action/federal-actions-clean-growth-economy/homes-buildings.html>

residents. The houses must be comfortable, reflective of the Cree lifestyle and able to withstand the northern climate.

Over the next 6 years, the first being a pilot year, the CNE plans to build 5 new single-family homes, 5 Six-Plexes and retrofit 25 existing homes. This initial inventory will offer private homeownership, rent-to-own and rental options, making housing accessible to everyone.

The NZE program is designed to encourage capacity building and a sense of community. By fostering a sense of pride in the community and Cree culture, our NZE program will become a model for Indigenous communities across Canada.

#### Reflects CNE's needs

The NZE program is reflective of the true needs of the CNE and its residents. The housing shortage facing Indigenous communities is undeniable and cannot be ignored.

Numerous studies have drawn attention to the enormity of housing issues in the North including the inadequate supply, poor quality construction, poor affordability and designs that address neither the rigorous climate of Canada's north nor the cultural realities of its Indigenous peoples. As noted by Andy Moorhouse, past President of the Kativik Municipal Housing Bureau, when speaking about the reality of remote northern Indigenous communities in a 2011 address, "Housing is not the only issue, but all issues relate to housing"<sup>2</sup>.

In its report on "On-Reserve Housing and Infrastructure: Recommendations for Change", the Senate Committee on Housing highlighted "the need to examine current initiatives to addressing housing on reserve". Citing one example of the challenges, the committee noted that even though \$300 million had been set aside by the federal government in 2008 for the First Nations Market Housing Fund, which was expected to result in 25,000 new home builds in 10 years, by May 2015 only 99 homes had been built. The Senate noted that new approaches to housing, including innovative designs, alternative programs and new methods of implementation are needed. Northern research has also identified that Euro-Canadian forms of housing are incompatible with the social structure of Indigenous families<sup>3</sup>.

CNE's NZE housing program is relevant and responsive to the needs of Eastmain. As of February 2019, the CNE had a shortfall of over fifty housing units, with the demand for two-bedroom units accounting for more than 50% of the current needs.

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<sup>2</sup> If Not Now, When: Addressing the On-going Inuit Housing Crisis in Canada.

<sup>3</sup> *Examining the impact of Euro-Canadian architecture on Inuit families living in Arctic Canada*, Dr. Peter Dawson, University of Calgary, 2003

Table 1 – CNE Housing Needs: Past and Future

Past 5 Years							
	2019	2018	2017	2016	2015		
Backlog per year	52	51	40	36	28		
Projection over 6-year period*							
	Current	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Housing Stock	255	256	263	270	277	284	290
New NZE Construction	1	7	7	7	7	7	6
Will reduce backlog to	51	44	37	30	23	17	

\*Note: It is expected that the housing needs will grow over the next few years as our younger generation ages.

As early as 2000, the Cree Naskapi Commission has emphasized the need to resolve the housing shortage and substandard housing in the Cree communities. Eastmain's NZE program is also in line with Government of Canada's national housing strategy which recognizes the housing crisis facing Indigenous communities and the need to develop new approaches that include increasing private homeownership opportunities, as well as the need to significantly improve the sustainability of housing in Indigenous communities.

Since 2017, the CNE has undertaken significant community engagement to ensure that its NZE housing program is meaningful for its members. In June 2017, the CNE held workshops, conducted home visits and consulted with members with a view to collecting information on house designs of different housing types. At the September 2017 annual general assembly, the CNE engaged in a broader discussion with its members for ideas on how to improve housing. These discussions have been complemented by consultations with service providers including health care and the fire department to ensure a comprehensive approach to addressing the housing shortage and ensuring a solution that is culturally-appropriate and reflective of the Cree way of life.

In addition, the CNE held its first Housing Forum in February 2018. The Housing Forum allowed CNE members to voice their views on the CNE housing needs and the Smart City Challenge proposal. The members contributed to the design of a culturally appropriate NZE multi-unit model home. The information and ideas obtained at the workshops, home visits and annual general assemblies led to the "Cree Café" where smaller focus groups have explored the issues and ideas generated during the broader consultative process. Through its Cree Cafés, the CNE has developed design innovations and established a means for ongoing community consultation on the NZE program.

In addition to high construction costs, the high cost of operation and maintenance remains a significant deterrent to home ownership and the development of home ownership programs in First Nations communities, including Eastmain. New home owners are often challenged to keep up with the high operating costs of their homes, while current social housing programs significantly subsidize operating costs. This deters potential buyers from investing into home ownership, remaining siloed into lifelong housing rental.

Adding to the ever-present concerns around housing shortages and affordability are the issues of energy efficiency, energy security and community resilience. Remote communities like Eastmain are subject to periodic power blackouts that can extend for days at a time. During power outages in Eastmain, most houses which were built to meet the “minimum” requirements of the building code, will freeze up within hours. Moreover, these same houses use considerably more energy than houses in southern Canadian cities, adding to the high cost of home operation while also contributing to climate change.

The Eastmain Cree are attached to their culture and regularly practice traditional activities. In fact, most families rely on hunting, fishing and trapping to supplement their diet. While in the bush practicing their traditional activities, the homes are unsupervised, making them vulnerable to the outcomes of power outages. The construction techniques and smart technologies proposed in the NZE program will significantly reduce these vulnerabilities.

#### Ambitious and Achievable

The proposal is not only ambitious, but it is realistically achievable. Less than 50 years ago, the CNE had no road access and very little infrastructure supporting its community. Today, Eastmain is a thriving community with an airport, arena, sports complex, schools, health clinic and stores. The CNE provides all the usual municipal services to its members.

The CNE currently has a need for 52 housing units that it cannot satisfy. In a community of 255 homes this is significant. The CNE plans to build 35 new housing units and retrofit 25 homes and buildings over the next six years. This amounts to improving the backlog by 67%. The scale of the proposed program is enormous considering the size and population of Eastmain.

The NZE program is ambitious in that it proposes to tackle a problem that is not simply local but extends to Indigenous communities across Canada. Housing is conceivably the biggest issue facing Indigenous communities which must deal with significant housing shortages and unsuitable construction materials and techniques.

In order to address the significant housing backlog, the CNE plans to implement its NZE housing program. The NZE program is designed to be sustainable because creating an affordable housing scheme doesn't only mean controlling the costs of construction, but also controlling the costs of operating and maintaining homes.

The Cree's connection to family and land are factors that must be at the forefront of any solution if the CNE initiative is to be successful and sustainable. By building new multi-family and single-family homes, and retrofit existing homes, the CNE will be able to offer its residents better quality housing options that respond to their needs and financial capacity.

The CNE has the structure and capacity to implement and achieve success of its NZE program. It has an economic development corporation, Wabannutao Eeyou Development Corporation, and a construction company, Stajune Construction Inc., that are often involved in local community construction projects. The CNE will use both companies with



a view to maximize local employment, entrepreneurship and housing affordability. It should be noted that Wabannutao Eeyou Development Corporation and Stajune Construction are in the process of restructuring to improve efficiencies for the implementation of our NZE program.

The CNE recognizes that the scope of its NZE program is such that it will need partners who can support and complement its efforts. The CNE carried out considerable consultation with community members and with experts in the areas pertaining to residential construction, construction standards and techniques and net-zero energy technologies.

The CNE identified potential partners because it recognizes that a program this ambitious cannot be undertaken alone. The CNE has established relationships with academia, businesses and government agencies and organizations to ensure the success of its NZE program. Where appropriate, the CNE has secured commitments from its partners and is developing formal agreements relating to the role that these partners will play in the program. These partners will all contribute to ensuring and measuring the success of the program.

In addition, the CNE has engaged with the supply chain. By sharing key information with suppliers, the CNE has been able to start tracking the actual costs of the NZE program. This is just the start of the Cree Nation of Eastmain's efforts to establish a resource management system aimed at enhancing accountability and responsibility.

The CNE has put significant effort and considered all its options to resolve the housing shortage and create better-built, energy-efficient homes. Creating an NZE community is therefore very ambitious but achievable.

#### Meaningful

The CNENZE program will realize outcomes that are meaningful for residents of Eastmain by constructing new NZE homes and retrofitting existing homes. The new homes will allow CNE members to enter the housing market at different economic levels while ensuring that members who rely on social housing are provided homes that can withstand the northern climate while offering a comfortable living environment.

CNE members have had a say in the NZE program through community consultation sessions and workshops at which they received information about NZE program and smart technologies. More importantly, our members played an important role in shaping the housing designs and the technologies that will be used in the NZE program, ensuring community-wide acceptance and approval.

The lack of adequate housing in Indigenous communities has resulted in overcrowding which is an important factor in many of the health and social issues affecting these communities. The current housing model and funding formulas in the on-reserve social housing program are not a sustainable solution to the housing shortage. These have resulted in the widespread use of housing designs that do not meet the cultural and social

needs of occupants and construction techniques and standards that are often not well-suited to northern climates.

#### Well-suited to Smart Cities Approach

The CNE NZE program is grounded in the past and forward-looking in proposing an achievable solution to the longstanding housing shortage, making it well suited to the Smart Cities approach. The CNE has a community wide fiber optic infrastructure, making it ideal for a Smart Cities approach to creating a connected, energy-efficient community.

Significant collaboration with experts, suppliers and key stakeholders has enabled the CNE to design its NZE program. Academic partners have jumped on board to undertake studies of measurable outcomes like energy savings and generation and less tangible outcomes like the comfort and happiness of occupants of NZE homes. Suppliers and government agencies consider the NZE program proposed by the CNE as creating new opportunities for development and capacity-building in the North.

The NZE program embodies the Smart Cities approach by employing smart technologies and connectivity to ensure open, transparent, accountable and responsible government. CNE is implementing a combination of ISO Standards to put in place processes and standards to better serve its members and increase transparency and accountability. These efforts include creating policies and First Nation laws that establish guidelines, a framework and rules in discrete areas, including housing. Given the importance of housing to community well-being, evolving societal views and the ever-changing technical landscape in this sector, the CNE intends to continue the revision of its Housing Policy, a process started at its Housing Forum, where members were given an opportunity to voice concerns and put forward ideas to improve community housing.

The smart technologies to be used in establishing NZE homes will ensure that traditional practices are supported in modern homes. Occupants or the CNE can monitor homes even while in the bush to ensure that the home systems are properly functioning.

The data generated through smart technologies will allow for better decision-making by the CNE and empower residents to better control energy use. This data will also enable the CNE to adjust its NZE program to be more responsive to the needs of its members. More importantly, such data may facilitate discussions with public energy agencies on energy use and with Canada Mortgage and Housing Corporation on housing designs and construction materials for northern climates.

The CNENZE program is transferrable to other communities facing housing issues and looking to create a more sustainable, resilient housing program. Not only can the NZE program be shared with other communities, it can be scaled to reflect the needs and capacities of these communities. Furthermore, our NZE program is particularly responsive even for off-grid communities as it will decrease the energy load on the diesel-generated electricity grids, thereby reducing significantly greenhouse gas emissions.

### Measurable

The smart technologies to be used in the construction and retrofitting of homes will permit detailed data collection relating to energy use and production. The CNE will leverage this data to make better decisions and ensure the NZE program attains its objectives. The data will also be used by the CNE and its partners to make improvements to the NZE program and measure its success.

In addition to monitoring the NZE program, a social research platform will be established to assess, over time, how the program is contributing to community well-being. Housing conditions are a well-recognized determinant of health. We will evaluate how the NZE program fosters a sense of well-being by (a) reducing overcrowding through the construction of new homes, (b) improving comfort and livability by retrofitting existing homes, (c) designing houses that meet the cultural and social needs of occupants, and (d) by offering a range of housing tenure.

This social research platform will also serve to document the opportunities, challenges and best practices for scaling the NZE housing program to other Indigenous communities across the country.

### **Progress toward Outcomes**

Since first submitting its proposal, the CNE has continued in its efforts to implement its NZE program.

The CNE has conducted community consultations and obtained community support for the NZE program. With input from members, the CNE has developed housing models that reflect and complement Cree culture in their layout and design.

The CNE has conducted modelling exercises to ensure that the NZE homes can achieve net-zero energy status. Through this process, the CNE has identified the building system, levels of insulation, the types of windows, the size of solar energy component and the other technical requirements needed to achieve net-zero energy in Eastmain.

Finally, the CNE has obtained funding from Canada Mortgage and Housing Corporation to develop and implement the social research platform in collaboration with the Canada Research Chair in Housing, Community and Health at McGill University in Montreal.

### **Why Choose Us**

The CNENZE program is concrete, measurable and transferable. This means that it aligns perfectly with Canada's declaration that housing in Indigenous communities is a government priority.

While NZE projects may not be considered innovative generally, establishing an NZE program in the North is innovative. Moreover, implementing a community-wide NZE program that includes multi-unit residential buildings has never been contemplated – until now. Implementing the NZE program as an opportunity for capacity-building also sets the CNENZE program apart and makes it innovative.

The CNE approach to the Indigenous community housing crisis makes our NZE program super-innovative. The CNE is addressing this holistically by bringing together community members, private sector actors, experts, public sector agencies and academia in order to find feasible solutions to creating affordable and resilient housing.

Much interest has been expressed in the CNE NZE program because it is aimed at a diverse clientele. Under our NZE program, the CNE is offering rental housing for low-income residents, rent-to-own and entry-level private homeownership. The designs give the CNE the flexibility of blending clientele for any combination in the Six-Plex and other housing options.

Unlike some proposals, the CNENZE program is relevant and responsive to the situation in many Indigenous communities across Canada. Creating an affordable, resilient housing program therefore also addresses a national problem, the critical housing shortage in Indigenous communities. The collection and analysis of pertinent data will allow the program to adapt accordingly to real quantifiable and qualifiable needs.

Our NZE program can be scaled to reflect the needs, financial constraints and capacities of other Indigenous communities across Canada. The program's scalability makes it easily transferable to other Indigenous and non-Indigenous communities as a solution to address housing shortages. Moreover, the program is designed to create economic development and capacity-building opportunities for Indigenous communities.

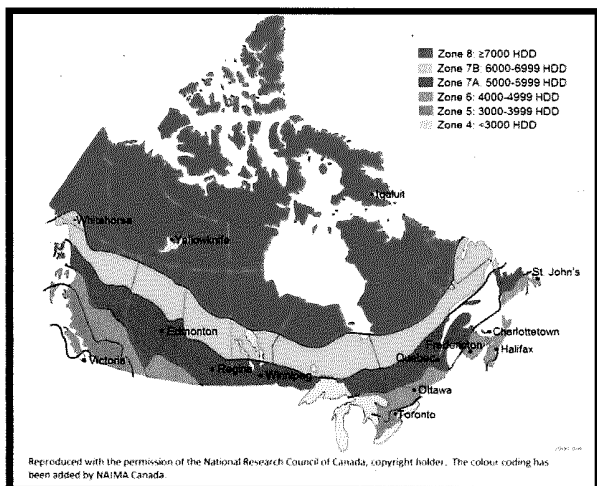
By designing a program that adheres to Smart City principles the CNE is setting the groundwork for a future of sustainable and durable housing for Indigenous communities that ensures openness, transparency and accountability at all levels. This means that members of these communities are involved in resolving the issues affecting their housing programs and informed of contracting and expenditures related to NZE homes.

## CHAPTER 2: PERFORMANCE MEASUREMENT

### Outcomes-based Performance Measurement Plan

Eastmain is located in Climate Zone 8 (Figure 1), the coldest climate zone in Canada.

Figure 1. Climate Zone Map



Its location and climate bring challenges to the CNE goal of creating a net-zero energy community. The collection and analysis of performance data relating to the NZE program is essential. Significant technical, social and costing data will be collected during the project. Technical data will be used to measure the performance of the homes constructed and retrofitted under the NZE program and will enable the CNE to identify shortcomings and take lessons-learned to make adjustments to the building systems and equipment accordingly. Social data will be used to measure the success and suitability of the designs

selected for the NZE program and to make changes as may be needed to ensure the comfort and enjoyment of the occupants. Costing data will be used to first determine the actual itemized costs of construction and to build on efforts to reduce the cost of housing construction in Eastmain.

To address the wide range of housing issues in Eastmain, as part of the Smart Cities Challenge, the CNE will continue its transition from a social housing-based program to a market-based program. The primary criteria for determining housing types for construction will be financial capacity. This will also involve changing the underlying culture in Eastmain where social housing has been deeply inculcated.

The Eastmain NZE housing program is aimed at responding to the need for housing while inciting a shift in culture.

#### Links to Outcomes

The program will have three primary components: (a) the design and construction of a culturally-appropriate net-zero energy Six-Plexes, (b) the design and construction of a net-zero energy single-family homes, and (c) the net-zero energy retrofitting of existing homes in the community, all of which will be equipped with smart home technologies. These three components will constitute the “next generation” housing in Eastmain and will enhance social inclusiveness, by stimulating our local economy and safeguarding the health and environment of our community.

Educating residents on the proper use and maintenance of housing will be a longer-term outcome of the CNE NZE program. Likewise, given the new housing policies and rules being implemented in Eeyou Istchee, the CNE must also find ways to inform suppliers and builders that wish to participate in residential construction in Eastmain of these policies and rules.

At the end of the NZE program, the CNE will have created a framework for the design, construction and operation of affordable, durable, comfortable and resilient net-zero energy houses in Northern communities.

### Project Activities

#### Consultation

The CNE has carried out ongoing consultations on housing issues in the community through a range of initiatives including the Eastmain Annual General Assemblies, Cree Café's, design charrettes (integrated design workshops), site visits, meetings, the Eastmain Housing Forum and the Eastmain Builders Forum.

The first step to creating the NZE housing program involved engaging the community in the design of a culturally-appropriate NZE Six-Plex, consisting of 2 social housing units, 2 rent-to-own units, and 2 starter home ownership units. The CNE then consulted members on the design of an NZE single-family home prototype as a model for residents wishing to purchase their own home.

Through further consultation, that included the health and public safety sectors, the CNE designed other NZE housing prototypes to accommodate different needs, including a "Cree Elders House", an "Accessible House" and a starter house. Consultation with the health and public safety sectors also allowed the CNE to ensure that the designs and components of the Six-Plex, single-family homes and Accessible Houses provided a healthy, comfortable living environment that would also respond to the needs of the occupants.

The CNE also engaged with experienced net-energy zero builders who have worked on projects in northern communities. These builders, with other net-energy zero experts, brought a perspective and experience that enabled the CNE to establish the best building strategies, techniques and materials.

The amplitude of the CNENZE program and the goal of creating affordable housing called for engagement with local builders by the CNE and the Cree Nation Government. Local builders were given information on the NZE building concepts and program structures. More importantly, by engaging with the local builders, the CNE obtained their feedback on the proposed building systems and ensured that the building systems and technologies are feasible in Eastmain. This process has set a strong foundation for the integration of the NZE program, thereby ensuring its success in Eastmain.

### Analysis

Much analysis and consideration went into defining the parameters of the CNENZE housing program to ensure that it was feasible and responsive to the realities of the North.

McGill University presented at the Eeyou Mitchuap forum on its Nunavik housing study. This study provides baseline information that has been useful in the preliminary analysis of housing requirements and models and will continue to be useful in testing the results of the CNENZE program.

The CNE consulted different experts on net-zero energy building systems, materials, technologies and construction strategies. Through extensive energy modelling on the Six-Plex and Accessible House the CNE was able to determine the level of energy production that would make net-zero energy feasible in Eastmain. The CNE has calculated the amount of energy production required, including the size of solar array and the capacity of air source heat pumps needed to attain net-zero energy. The CNE has thus determined, in its climate, the combination of energy saving construction techniques and materials (wall systems, insulation levels, windows, etc.) with energy producing technologies (solar photovoltaics, air source heat pump) to successfully achieve net-zero energy.

Analysis will include the activities conducted after implementation of the NZE program. The CNENZE program will include establishing a detailed costing regime that will ensure Smart Cites Challenge funds are used to deliver affordable net-zero energy houses and retrofits with smart technologies within the community. The costing regime will include an in-depth analysis of the transportation costs incurred to bring construction materials to Eastmain. This analysis will enable the CNE to determine the impact of transportation on the overall cost of housing in northern, remote communities like Eastmain.

### Pre-NZE Activities

The CNE carried out an assessment of its existing housing inventory to determine the amount and type of renovations required to improve the functionality of these homes. This assessment will permit the CNE to identify the houses that will be best suited for retrofitting to make them function at the net-energy zero level.

Following significant community consultation which enabled the CNE to identify the floor plans and designs, it was time to decide on construction timelines. In order to ensure the program's success, the CNE has chosen to start with a single-family home that will allow it to test its processes and construction techniques. This choice was also driven by the necessity for an Accessible House in the community to respond to the needs of a disabled member. The CNE conducted extensive energy modelling on the Accessible House to ensure that it could satisfy the net-energy zero performance standards.

### NZE Program Activities

In 2019, the CNE will construct one single-family Accessible House and carry out one retrofit of an existing home as part of a pilot project. This will also serve as a prototype for Eastmain residents with disabilities. The CNE will have the opportunity to test the construction materials and the building system used in projects before proceeding with the construction of additional single-family homes, multi-unit housing and retrofits.

These initial construction projects will be used to develop a detailed and comprehensive list of all the materials required for each of the net-zero energy housing projects – the Six-Plex, single-family home and net-zero retrofit. The CNE will also create a detailed breakdown of projected labor costs for each stage of the construction process. Proper tracking and recording of the materials and labour required for each project will ensure that the NZE program is sustainable, affordable and transparent.

An in-depth post-construction evaluation will be carried out that includes a cost comparative analysis of the projected material and labor costs with those of the detailed costs that were tracked during the construction process. This evaluation and comparative analysis, combined with quantitative data obtained from Hydro-Quebec meters and the Concordia University study, will allow the CNE to make improvements aimed at ensuring the performance of the net-zero energy building system. Lessons learned from the construction of the Accessible House will be used and scaled to the Six-Plex. From its experience during the pilot project phase, the CNE will select the materials for the construction of the Six-Plex and future single-family homes.

The CNE has already identified transportation times as a significant factor in project delays and costs, especially in remote communities, as well as the inability to store enough construction materials on site to ensure continuity of work on projects. To address this issue, in 2019, the CNE will construct or rehabilitate a facility where construction materials can be stored and building components can be assembled. This is a significant change in how construction projects are usually managed in Eastmain where materials are purchased only when construction is to start, with delivery occurring much later, leading to work stoppage when supplies or materials run out as well as delays in starting construction. By having a storage facility on-site, the CNE can time its purchasing to get a better price on materials, buy in bulk, and be in a position to commence construction immediately. This approach will also permit the CNE to maintain and control an inventory, reduce wastage and prevent the deterioration of materials.

In 2020, the CNE will construct a single-family home and one Six-Plex. In addition, the CNE will retrofit four existing residential units. To retrofit existing homes to net-zero energy standards, the CNE will incorporate a super energy-efficient “wall panel system”, in conjunction with construction techniques that will enhance the energy efficiency of foundations and roofs.

Keeping in mind the goal of building a strong community, the NZE program includes various opportunities for capacity-building and economic development.

#### **Timelines and Deliverables**

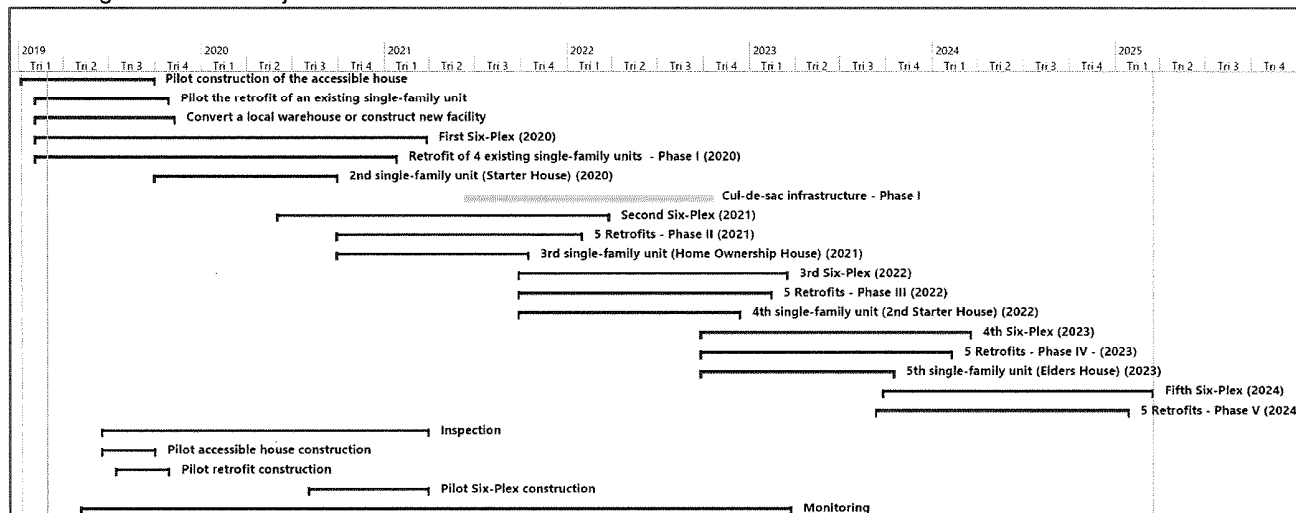
Our NZE program is a multi-year, multi-phase project during which the CNE will construct single-family homes and multi-unit buildings and retrofit existing homes. In year 1, 2019, the CNE will construct, as part of a pilot project, an NZE single-family Accessible House and retro one existing home. In the second year, the CNE will build one NZE Six-Plex and one single-family home and will carry out NZE retrofitting of four homes. In 2021, and for



all the subsequent years, the CNE plans to construct one Six-Plex and one single-family home, except in the last year, and carry out 5 retrofits following the 2020 schedule.

The below tables set out the timelines for the NZE program.

Figure 2. 2019 Project Timelines



### Payment Schedule

The CNE has based the payment schedule on the above timelines. The payment schedule is intended to reflect the amounts needed to successfully complete the activities within the established timelines.

#### Payment Schedule

With these and the projected construction costs, training costs and other related costs, the CNE has established the following payment schedule for the Smart Cities Challenge prize money that is reasonable and rational.

Table 2 – Payment Schedule

Year Ended	Year Ended	Year Ended	Year Ended	Year Ended	Year Ended	Total
31-Mar-20	31-Mar-21	31-Mar-22	31-Mar-23	31-Mar-24	31-Mar-25	
Proforma	Proforma	Proforma	Proforma	Proforma	Proforma	
\$517,285	\$1,160,551	\$1,225,331	\$1,063,633	\$1,033,200	-	<b>\$5,000,000</b>

### Quantitative and Qualitative Indicators

The CNE has established a collaborative relationship with Concordia University and McGill University for the purpose of permitting the collection and analysis of quantitative

and qualitative data. This data, which will allow us to measure the success of the NZE program, includes

- air quality
- thermal comfort through
  - ❖ objective measurements on energy efficiency
  - ❖ resident's self-reported assessments of thermal comfort
- energy consumption
- energy production
- Potential moisture issues in building components
- decay heat loss
- energy use trends
- well-being, based on indicators like
  - ❖ satisfaction with new home designs and retrofitted homes
  - ❖ thermal comfort
  - ❖ sense of home
  - ❖ quality of life
  - ❖ social inclusion, including socioeconomic indicators

#### Quantitative Data Measurement

The technologies to be implemented in this project are innovative and new to the region. The performance data to be collected is invaluable to validate their (a) application and (b) long-term performance, and to (c) improve the design, construction and operation of net-zero energy homes in northern regions.

Field data to be collected will be used to determine the (a) actual net-zero energy status of the homes, and (b) understand occupants' interaction with and operation of net-zero energy homes (like the set-points of indoor temperature, operation of HRV and air source heat pumps, window use, etc.). This data on indoor environmental quality will also be used in the qualitative study to assess the well-being of occupants with respect to the physical environment.

#### Qualitative Data Measurement

McGill University will conduct surveys and group meetings and attend Cree Cafés to collect information relating to occupants' experience in net-zero energy homes and retrofitted homes. The data will measure, amongst others, the (a) level of satisfaction with home designs and layouts, (b) operational functions, (c) compatibility with Cree culture and (d) pride in ownership.

#### Energy Modelling

The CNE will carry out detailed comprehensive energy modelling of the single-family home, the Six-Plex and the net-zero energy retrofits using Integrated Environmental

Solutions (IES) or Energy Plus systems and drawing upon the lessons-learned during the construction of the Accessible House. The energy modelling will consider the effects of (a) night-time free cooling, (b) crawl space thermal mass and (b) shading to eliminate or reduce the use of air-conditioning, and provide recommendations aimed at improving the resiliency of the net-zero energy homes constructed in Eastmain.

The activities carried out during the comprehensive energy-modelling will include

- energy modelling based on the actual designs
- comparison of the energy-modelling results to HOT2000 software results
- optimization of the passive design and integration of the proposed technologies
- calibration of the comprehensive energy modelling with the field monitoring data collected on the Accessible House to optimize the design and construction of NZE homes
- hygrothermal modelling using the software WUFI Pro, calibrated with field measurements, that will be used to design alternative moisture-resistant envelope assemblies for net-zero energy homes in other climatic regions.

### Monitoring, Reporting and Evaluation

#### Monitoring

The CNE and its partners, Concordia University and McGill University, will carry out various monitoring activities that will enable them to ascertain the success of the NZE program.

The sensors installed in the homes will collect important data that will be communicated through the battery operated dataloggers to a web-connected computer managed by the Cree Nation of Eastmain's Housing Department. The data will then be anonymized before uploading to an analytical website where it can be analysed by Concordia University. In addition, Concordia University will conduct quantitative studies on the air quality and energy consumption of a sampling of each of the housing prototypes constructed under the NZE program and the net-zero energy retrofit homes.

McGill University will analyse occupants' experience in the NZE homes and retrofitted homes. The well-being of the occupants will be measured and monitored over time using a range of indicators as described in the previous section. Data will be collected each year, using survey questionnaires administered to all Eastmain residents. This process will allow McGill University to monitor any change in the sense of well-being over time for Eastmain residents who move into NZE homes or whose homes are retrofitted and compare this to those residents whose housing situation does not change.

Given that smart meters have been installed on most homes, the CNE will seek to obtain quantitative information from Hydro-Québec respecting the energy consumption of each home. Using baseline data on non-NZE homes, the CNE will be able to determine if the NZE program is achieving its objectives and measure this achievement.

Controlling the costs and timelines for constructing NZE homes requires consistent monitoring. As part of its NZE program, the CNE will establish a supply management system. This system will enable better monitoring and control of construction materials and their costs, including the transportation costs, as well as ensuring timely ordering to avoid delays.

#### Field Monitoring

Field monitoring will enable the CNE to identify any deficiencies in the program and ensure that the lessons learned through monitoring are applied to the NZE program. This will ensure that the NZE program is constantly adapting and improving to correct those deficiencies identified, if any, and responding to the needs of the community.

The monitoring protocol developed in year one of the NZE program will be applied to the construction and retrofitting projects in subsequent years. In year one, the Accessible House, scheduled to be completed by September 2019, will be monitored. The data collected through monitoring will be used to validate the design and construction techniques used, correct any issues, and incorporate design alterations to make improvements to the building's performance. For housing projects constructed in subsequent years, a similar data collection plan would be implemented for performance comparisons. Field monitoring will include:

- hygrothermal performance of the building envelope to ensure durability
- indoor environmental quality including
  - ❖ indoor air quality
  - ❖ thermal conditions
- energy performance including end energy use of
  - ❖ HVAC equipment
  - ❖ lighting
  - ❖ appliances
  - ❖ any other equipment
- energy generation of photovoltaic array

Concordia University will visit Eastmain twice during each construction season. The first visit will take place after the framing and roofing have been completed to install sensors and dataloggers, conduct blower door tests and seal any openings in the building envelope. Once construction is substantially completed, Concordia University will return to Eastmain to install energy monitoring equipment on the different systems, ensure the proper functioning of the sensors previously installed and conduct a second blower door test.

#### Hygrothermal Performance

The hygrothermal conditions, including the relative humidity and temperature (RH/T), of the envelope assemblies such as the walls, roof, attic and crawl space will be monitored. This data will be used to assess the risk of moisture-damage arising from condensation,

decay and mould growth. An on-site weather station will be installed to monitor the wind speed, wind direction, rainfall intensity and global solar radiation. The weather station data will be used to correlate the hygrothermal performance and energy consumption and production of the NZE homes with local weather data for field data analysis and model validation.

#### Indoor thermal conditions and CO<sub>2</sub>

RH/T and CO<sub>2</sub> sensors will be installed in indoor spaces to monitor thermal conditions and indoor air quality, thus enabling the CNE to confirm that indoor air quality standards are being met in the NZE homes and retrofits. This information will also be used to assess performance of the HRV system and determine if it is delivering sufficient ventilation to the housing units. Indoor RH conditions when combined with temperature data, will be used to assess thermal comfort. The RH data will also be used to determine the moisture loads for hygrothermal modeling to evaluate the resiliency of the NZE homes.

#### Energy Monitoring

Understanding and evaluating energy use and production in NZE homes is paramount to successfully achieving high performance and annual net-zero energy use. Both energy consumption and production patterns will be monitored. Monitoring will measure

- energy consumed by discrete building systems will be monitored, including
  - ❖ the air source heat pump and ducted mini-split (Heating)
  - ❖ ventilation fans
- appliances, including
  - ❖ stove
  - ❖ dishwasher
  - ❖ washer
  - ❖ dryer
- plug loads and lighting (other than those attached to building systems and appliances)
- Heat Recovery Ventilator (HRV), including
  - ❖ temperature conditions on all 4 sides of the HRV to calculate efficiency
  - ❖ temperature readings at exhaust inlet/outlet and supply inlet/outlet
  - ❖ air flow rates
- electricity produced by the solar PV array

The monitoring protocol and modeling strategies developed during the NZE program can be implemented in other northern communities, including remote, northern off-grid communities, to investigate options for the design, construction and technologies of net-zero energy homes. The protocol will also be useful for developing the framework/guide for creating successful, affordable and resilient net-energy zero housing.

## Risk Management

### Identification of Risks

Table 3 – Performance Measurement Risks and Mitigation Strategies

Risks	Preventive Measures	Corrective Measures
Power loss to data loggers	Install data loggers with a battery backup and regularly verify power	Replace battery
Loss of internet connection		Data collected from sensors will be stored in a local computer until connection is restored and then will be transferred*
Faulty sensors	Test sensors prior to installation and after installation to ensure proper functioning and accuracy	Replace faulty sensors
Power loss to data collection computer	Use a battery power supply and an uninterrupted power supply (UPS)	Use backup Laptop computer Reboot computer when power is restored*
Data collection program crashes	A script has been written to force laptops to automatically reboot at certain intervals to ensure performance	Laptop will be restarted manually if necessary*

\* On-site support is available in Eastmain allowing remote troubleshooting

## CHAPTER 3: PROJECT MANAGEMENT

The CNE has put significant effort into establishing a project management framework that will cover all phases of the NZE program. From identifying resources and needs to develop resources locally, to identifying the accounting, monitoring and reporting methods the project management plan proposed by the CNE will ensure the success of our NZE program.

To be long-term, the NZE program must look to the future and find ways to bind the community to the program. The CNE therefore established partnerships aimed at building capacity locally in the trades and specialized fields. This will guarantee success of our NZE program as Eastmain becomes more self-sufficient and its residents have opportunities to grow and create better lives for themselves and their families.

### Project Scope and Scheduling

#### Project Scope

The NZE program consists of several projects and phases. Starting with the construction of a net-zero energy Accessible House and NZE retrofit. In support of this program, the CNE will establish a warehousing and inventory-costing system. In the subsequent years, the CNE will add on projects in a carefully thought-out sequence, that will include an Elders House and Private Homeownership Houses.

In preparation of the NZE retrofit project, the CNE has availed itself of an Indigenous Services Canada initiative to carry out an inspection and full-scale assessment of 24

existing houses in Eastmain. The inspection will include an estimate of the costs of renovation and an appraisal of the house. The data obtained from this will assist the CNE in identifying the houses to be retrofitted under the NZE retrofit program.

The NZE program also consists of ancillary projects that will support the program. These include the construction or rehabilitation of a facility for warehousing construction materials and assembling building components. This facility will enable capacity-building and create employment and economic development opportunities for the residents of Eastmain, which in turn will pave the way toward creating a strong, healthy community.

### Resources Assessment

The CNE has the human, material and financial resources needed to make its NZE program a success. By phasing in the projects to be completed as part of the NZE program, the CNE will also ensure that it has the experience and capacity for each phase. This will also give it time to create capacity where needed.

Table 4 – Resource Assessment

Workforce Capacity		
The CNE has the human, material and financial resources needed to make its NZE program a success. CNE's construction company, Stajune Construction Inc., has experience carrying out large and smaller scale projects in Eastmain.		
An inventory of workforce resources has allowed the CNE to identify lacunae in the community and the areas where capacity-building must be focussed. In the interim, there are specialized tradespeople in other Cree communities and nearby Quebec cities who are eager to work on the pilot projects, while the CNE builds up its local capacity.		
Project management capacity	Experienced project manager	
	Housing specialist	
	Design consultant	
	Civil engineer	
	Chartered Accountant	
Trades capacity	Trades	Quantity
	Foreman	3
	Carpenters	21
	Machinery operator	16
	Plumber	0
	Electrician	0
	HVAC	0
Infrastructure readiness		
The CNE has <b>30 fully serviced lots ready</b> for new NZE homes.		
Eastmain has a <b>complete fiber optic infrastructure</b> throughout the community. This will enable long-term data monitoring and residents' access to the information obtained through the NZE program.		
There are local <b>warehouse facilities</b> where construction materials can be stored and building components assembled of. The CNE plans <b>to build or to renovate a warehousing facility</b> to store construction materials and assemble building components.		

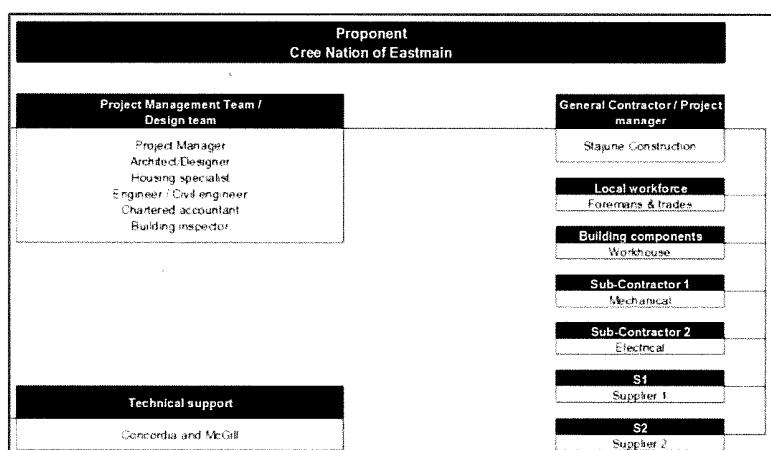
### Workforce Capacity

The CNE will work with its construction company, Stajune Construction Inc., to implement the NZE program, each operating in their sphere of activity toward the success of the whole program.

The success of the NZE program rests on having a good foundation. In this case, the foundation is the project management team that will oversee the projects carried out under the NZE program and support to Stajune Construction in its management of the construction projects and cost control. The NZE Project Management Team will be made up of the resources identified in Figure 3.

The NZE Project Management Team has over 90 years of combined experience in finance and administration and 80 years in the construction industry. Project Management Team expertise includes financial management, LEED certification, super energy-efficient building techniques and northern and remote housing. The Team further benefits from the partnerships established with universities, government agencies and industry experts who have been involved in our NZE program.

Figure 3. Project Management Flow



Stajune Construction will act as the general contractor/project manager of the NZE construction projects. Work will be subcontracted out to local companies and entrepreneurs operating in the construction sector. The CNE has held consultations with local contractors who have all indicated their willingness to work collaboratively on the NZE projects. These contractors understand the critical issues

and the importance of completing the various projects on time and on budget.

#### Current Workforce

In February 2019, the CNE held a construction meeting for the purpose of inventorying certain trades in Eastmain.

This inventory has allowed the CNE to identify lacunae in the community and the areas where capacity-building must be focussed. In the interim, there are specialized trades in other Cree communities and nearby Quebec cities who are eager to work on the pilot projects, while the CNE builds up its local capacity.



Although the CNE did not do an inventory of general labourers, a Cree Nation Market Survey compiled by Cree Human Resources Development (CHRD), there are approximately 17 men and 22 women looking for employment in Eastmain. Given that Eastmain's total workforce is 498, this yields an unemployment rate of approximately 8%.

#### Capacity-Building

To be meaningful and impactful to the community, the NZE program must be sustainable well beyond the scope and timelines of the Smart Cities Challenge. The CNE must therefore ensure that it can develop the capacity of the local workforce. Throughout its NZE program, workers will develop specialized skills including

- net-zero energy building techniques
- wall systems construction
- flooring
- cabinetry
- electrical and plumbing
- HVAC installation and maintenance
- roofing
- retrofitting

Planning for capacity-building activities has already started. The CNE is currently working with potential partners who are experienced net-zero energy builders, to provide work placement training. Four carpenters have been identified for training on net-zero energy construction techniques and systems. The training will give these workers the skills required to carry out and supervise net-zero energy construction.

In addition, two CNE employees will also receive work placement training on net-zero energy retrofits. These employees will work with our partner on a retrofit project to be carried out between March and April 2019. The retrofit training will include

- air tightness principles and techniques
- net-zero energy techniques
- wall systems construction
- digital capture techniques for dimensioning existing buildings
- supervising net-zero energy housing projects
- the do's and don'ts in retrofit projects

As part of the training, the partner will conduct follow-up site visits during the construction phase of our NZE projects between 2019 and 2020, thus ensuring the net-zero energy skills are fully integrated and rooted in Eastmain.

Other trades people have expressed an interest in receiving training in electrical and plumbing and HVAC installation and maintenance. The CNE will work with the Cree School Board and its partners to identify training opportunities for local trades. More

specifically, the CNE will begin exploring programs with the Cree School Board, CHRD and other vocational schools that offer certification programs in electrical, plumbing, carpentry and heating and ventilation systems. Ideally, training will be provided during the Smart Cities Challenge projects, with the goal of developing these skills in Eastmain within a five-year timeline. The CNE intends to invite skilled external tradespeople to Eastmain to work on NZE projects who will be required to hire local apprentices. It is anticipated that this approach will reduce construction costs because the use of external contractors generally means higher hourly fees and costs associated with travel, and room and board.

The CNE will not only focus on the trades side of the NZE projects but will also identify training opportunities aimed at augmenting project management capacities locally. Eventually, the CNE intends to have local people trained as certified project managers through the Project Management Institute. More importantly, the CNE will look to obtain comprehensive training in cost accounting and MS Project.

One identified area of concern is the need for qualified building inspectors. In fact, the lack of qualified building inspectors who can verify that homes and other constructions have been built to National Building Code standards is often cited as an underlying, contributing factor in the quality of construction projects in the Canadian north. Meanwhile, the CNE is presently training Home inspectors through a program funded by CHRD and offered by Cree Nation Government. These newly qualified Home inspectors will be instrumental in recommending suitable homes for NZE retrofitting to the Cree Nation of Eastmain.

The CNE has also identified other opportunities for capacity-building of the local workforce. These include

- collaborating with the National Research Council (NRC) to develop building science and related construction skills through seasonal employment of a local Indigenous engineering student on NRC building science research projects
- collaborating with Concordia University Department of Building, Civil and Environmental Engineering and the Centre for Zero Energy Building Studies to develop engineering and building science skills in Eastmain, which has a long-term goal of having a Cree engineer and encompasses the opportunity for a local Cree student to
  - ❖ work with the Concordia University data monitoring team to install equipment and collect data on our NZE projects
  - ❖ assist with project oversight and data collection relating to, amongst others, materials, production by trades and costing
  - ❖ enroll in the Engineering Co-op program and have a summer co-op placement in Eastmain

#### Financial Resources

Both the CNE and Stajune Construction are subject to independent public audit by a financial auditing firm. As part of the Cree Nation of Eastmain's IMS implementation, contractor and supplier management will also be audited throughout the NZE program.

With the exception of the Smart Cities Challenge winner's prize and revenues that will be generated through the lease or sale of housing units, funding for our NZE program has been secured. In identifying funding, the CNE did not identify government and agency funding programs that may be accessed to complete projects under the NZE program because these must be applied for and, until approved, cannot be considered secured sources of funds. However, the CNE will apply for available funding under different programs.

The CNE financial resources include allocations from the CNE Local Economic Development Fund, the annual subsidies for housing and infrastructure under the Infrastructure Fund, funds from the Housing Action Plan and Cree Nation Government regular program subsidies.

#### Infrastructure Readiness

The actual construction of net-zero energy homes means that there must be sufficient space and adequate infrastructure to support the new construction. The CNE has recently completed a geomorphic study of the entire community.

Weather is always a risk in the James Bay region. Cold temperatures and snow can arrive early and often stay late into the construction season. The CNE knows that weather often results in delayed completion of construction and the deterioration of materials purchased for projects. While the CNE cannot control weather, it can take steps to mitigate the impacts weather has on its NZE projects. In order to attenuate the impacts that the northern climate has on the timely completion of construction projects and the inherent costs arising from delays, the CNE plans to establish a warehousing facility. The facility will be used to inventory and store construction materials and to assemble certain building components. More importantly though, by having a local warehouse, the CNE can order materials and supplies in bulk for projects before the start of the construction season, avoiding the added delays resulting from transportation times.

The CNE has carefully considered two options for such a facility. An existing warehouse in Eastmain that can be renovated to accommodate the needs of the NZE program, or the CNE can construct a new building. Each option was costed. Renovation of an existing warehouse will cost approximately \$450,000 while a new build comes in at around \$1,464,613 of which up to 70% can be leveraged through capital funding programs which amounts to almost \$1,000,000 of the total cost. This brings the costs of a new build in line with those for the renovation.

The new build, as costed, would be significantly larger, at 8,100 square feet as opposed to 3,500 square feet for the existing facility. In addition, this facility will also be used for the assembly of building components thereby reducing construction times and lowering construction costs while creating employment and economic development opportunities in Eastmain. In light of these benefits, the CNE has chosen to proceed with applying for funding for the construction of a new facility. If approved, the CNE can proceed with construction in 2019. If the CNE is not allocated funding under these programs, it will

examine the advantages of renovating an existing warehouse versus scaling the new build smaller in order to be able to carry out construction as funds becomes available.

*Table 5 – Comparison Facility New Build vs Renovation*

Options	Description	Building area (sq2)	Cost
1	Existing warehouse renovation	3,500	\$450,000.00
2	New building	8,100	\$1,464,613 (which includes a maximum grant up to \$1M)

The facility, if a new build, will be owned and operated in partnership by the CNE and Stajune Construction as a community project. The new facility would also serve as the offices of the CNE Housing Department and as a maintenance shop. The Housing Department will be responsible for the areas of the facility where bulk ordered construction materials for NZE homes are stored and for the Housing Department's preventive maintenance programs. Another area of the facility will be used for the assembly and storage of the building components.

The facility will allow for the assembly of building components during the months of November to May, eliminating costs that occur from building during winter conditions. As well as increasing the length of the building season, the facility will also take advantage of being able to carry out work in a facility that is dedicated specifically for constructing building components such as wall panels.

The stored materials will be used for housing units constructed under the Smart Cities Challenge, band housing, ongoing housing preventative maintenance programme, the construction of cabinets and the resale of building materials to Eastmain residents who have no local option for attaining building materials for household projects.

In the event the facility is not completed before the CNE must order materials for year 2 of the NZE program, there are other warehouse facilities in the community. These can be used on a short-term basis to store construction materials delivered before completion of the facility and to assemble the building components that will be needed in the upcoming projects.

### **Project Management Strategies**

Our NZE program is ambitious and large-scale. With so many areas of activity it is essential to come up with strategies for addressing issues, managing procurement and supply chain, ensuring outcomes are impactful on the stakeholders and that communications enhance community inclusion. The CNE has systems and processes already in place that are the foundation to its project management strategies.

### Risk Identification and Mitigation

All projects face challenges that threaten their success and none more so than construction projects that are vulnerable to weather, supply, transportation and many

other factors. The CNE and its partners have identified these risks and designed strategies aimed at avoiding these risks or mitigating their impact on the NZE program.

Since being selected as a Smart Cities finalist, the CNE has identified certain risks that it mitigated by adjusting its NZE program to ensure it can achieve the stated outcomes. More particularly, the CNE had concerns that the timelines, vis-à-vis its present capacity, and financial resources put at risk the success of the NZE program. Consequently, the CNE has modified the timelines and milestones, setting attainable objectives and phasing in parts of its NZE program. By starting with smaller, more contained projects, the CNE will be able to test its processes and procedures and validate its choices to ensure the success of the NZE program.

CNE has also had to re-evaluate its initial proposal after it carried out program costing. Presently, there are no programs in Quebec that support residential applications of solar and alternative energy. As a result, the inclusion of certain net-zero energy technologies added significantly to the costs of construction of NZE homes. In order to control these costs, the CNE has considered constructing net-zero ready homes provided that these homes achieve near net-zero performance and offer the same characteristics in terms of design and resilience. And develop a local "Green Technologies" program to subsidize the purchase and installation of solar photovoltaic systems, similar to programs in other provinces.

There are also risks inherent in relying on technology which may be protected by patent or copyright, difficult to obtain or service or subject to frequent modifications. By relying on commercially-available technology and equipment the CNE will be reassured of their quality and availability as well as the ability to obtain professional technical support when needed.

Table 6 – Risk Analysis

Cause	Risk	Mitigation measures	Risk (3 to 1)
Lack of available workforce	Failure to attain level of local capacity needed for projects	<ul style="list-style-type: none"> <li>Recruit locally for skilled trades</li> <li>Train additional tradespeople</li> <li>Contract/hire externally</li> </ul>	2
Design flaws Energy modelling based on assumed data Quality during construction	Failure to reach net-zero targets	<ul style="list-style-type: none"> <li>Carry out additional data modeling using alternative programs</li> <li>Use data from weather station to verify assumptions in energy modeling</li> <li>Re-evaluate NZE construction details and technologies</li> <li>Implement inspection program and increase frequency of site inspections</li> <li>Augment net-zero construction training for skilled trades</li> </ul>	1
Incorrect estimates of quantity of materials needed Construction modifications on site	Insufficient inventory of construction material	<ul style="list-style-type: none"> <li>Implement inventory control system</li> <li>Order materials 8 months before project start date</li> <li>Order needed materials for shipment to warehouse</li> <li>Evaluate and improve inventory control and estimates exercise</li> </ul>	2

Unexpected events on site Weather Extra work on site Incorrect productivity and work duration estimates	Failure to meet construction timelines	<ul style="list-style-type: none"> <li>▪ Apply contractor/supplier management best practices</li> <li>▪ Apply contract reward/penalty clause</li> <li>▪ Hire experienced construction PM</li> <li>▪ Use a project management software</li> <li>▪ Conduct periodic evaluations of construction and project management processes</li> <li>▪ Hire additional skilled tradesmen</li> <li>▪ Implement process improvement measures</li> <li>▪ Adjust project scope and timelines</li> </ul>	1
	Cost overruns	<ul style="list-style-type: none"> <li>▪ Implement contractor/supplier management best practices</li> <li>▪ Hire experienced construction PM</li> <li>▪ Conduct audit on all construction and project management processes</li> <li>▪ Adjust project scope and budgets</li> <li>▪ Identify source of cost overruns and apply audit findings to improve efficiencies</li> </ul>	1
Unexpected events on site Weather Extra work on site Wrong productivity and works duration estimates Wrong cost estimates	Inability to sell units if purchasers cannot obtain financing	<ul style="list-style-type: none"> <li>▪ Pre-screen and pre-qualify purchasers</li> <li>▪ Identify new purchasers</li> <li>▪ Reclassify private homeownership unit as rent-to-own</li> </ul>	2
	Contractor unable to secure necessary financing to carry on construction work	<ul style="list-style-type: none"> <li>▪ Assist companies in accessing capital funds on a project-by-project basis</li> <li>▪ Encourage partnerships and joint ventures between companies to improve financial capacity</li> <li>▪ Manage the project directly through Stajune</li> <li>▪ Increase CNE investment in the project</li> </ul>	2
Fail to do credit check / obtain information on tenant financial capacity	Inadequate rent collection to support operation/maintenance of rental units and to build reserve funds	<ul style="list-style-type: none"> <li>▪ Pre-qualify renters through credit check</li> <li>▪ Verify capacity to pay</li> <li>▪ Credit bureau reporting on delinquent accounts</li> <li>▪ Ensure agreements are fair to CNE and tenants but protect CNE investment</li> <li>▪ Terminate rental agreement and evict delinquent tenant</li> <li>▪ Require solvent co-signer on rental agreements</li> <li>▪ Sanction arrears by forfeiture of CNE subsidies and application of grants to rental arrears</li> <li>▪ Suspend eligibility for CNE grants, loans and subsidies to persons with rental arrears</li> <li>▪ Take legal action</li> </ul>	2
Incomplete surveys or site inspection	Ground bearing capacity too low (geotechnical)	<ul style="list-style-type: none"> <li>▪ Verify ground composition with a geotechnical survey</li> <li>▪ Mention geotechnical details in contract documentation</li> <li>▪ Install piles or other system to reinforce foundations</li> </ul>	2
	Incomplete building design	<ul style="list-style-type: none"> <li>▪ Foundation modifications with geotechnical survey</li> <li>▪ Verify design exceptions (solar panel, insulation, etc.)</li> </ul>	2
	Lack of interest from buyers	<ul style="list-style-type: none"> <li>▪ Explain NZE experience by using pamphlets</li> <li>▪ Bring out the difference made in community and chance to realise unique projects</li> </ul>	2
	Experience in NZE units does not meet occupants' expectations	<ul style="list-style-type: none"> <li>▪ Confirm occupant satisfaction with the design</li> <li>▪ Ensure design meets occupants' need before occupancy</li> <li>▪ Conduct extensive and redesign of future housing units</li> </ul>	2
	Negative reaction to living in multi-unit housing	<ul style="list-style-type: none"> <li>▪ Evaluate underlying issues affecting satisfaction</li> <li>▪ Elaborate construction strategies to address these issues</li> <li>▪ Conduct consultation to identify occupants' concerns and needs</li> </ul>	2

		<ul style="list-style-type: none"> <li>▪ Develop and implement a strategy that addresses these issues</li> </ul>	
	Improper use of building technologies (smart, HVAC, alternative energy, security)	<ul style="list-style-type: none"> <li>▪ Pre-occupancy education and training</li> <li>▪ Create/distribute information pamphlets and labels</li> <li>▪ Carry out inspections and surveys</li> <li>▪ Train occupants in the use of all technologies</li> </ul>	2
Incomplete information given to occupants on their role in NZE program	Occupants do not consent to the collection of personal information	<ul style="list-style-type: none"> <li>▪ Explain stakeholder engagement that clearly adheres to all PIPEDA principles</li> <li>▪ Restrict data collection to units where occupants gave consent</li> <li>▪ Restrict data access to CNE or external, as the case may be</li> <li>▪ Take steps to alleviate occupants' concerns with data collection</li> </ul>	3
Mismanagement of data Database system incomplete or missing	Intentional or unintentional data loss or data security breach	<ul style="list-style-type: none"> <li>▪ Execution of data storage and security agreements with partners based on PIPEDA principles</li> <li>▪ Application of CNE ISO/IMS and audit programme</li> <li>▪ Institute preventive measures and corrective actions identified in the audit programme</li> <li>▪ Re-evaluate and make necessary changes to data access and security arrangements</li> </ul>	2
Collaboration contract not made Terms of the research were not explained or well understood	Resident disengagement from long-term research activities assessing impacts on well-being	<ul style="list-style-type: none"> <li>▪ Conduct community meetings with partners to discuss relevancy of project objectives to residents' needs</li> <li>▪ Establish communication plan to engage meaningfully with residents through sharing circles, social media and other forums</li> <li>▪ Adapt the project continuously to reflect community feedback</li> <li>▪ Communicate with local CMC workers to identify and address barriers to community engagement</li> </ul>	3
	Housing assignment leads to real or perceived inequity amongst CNE members	<ul style="list-style-type: none"> <li>▪ Conduct analyses of changes in home and health status and health over time</li> <li>▪ Identify at-risk sub-population groups based on analyses</li> <li>▪ Adapt housing policies to implement suitable interventions to populations groups most at-risk for housing inequities</li> </ul>	2

\*Note: highlighted risks directly linked to KPIs in Table 11.

\*\*Note: floor plans were designed to allow living area to be reduced by removing rear section from first floor.

### Procurement

In order to control the costs of the NZE projects, the CNE has created a procurement strategy. The strategy was developed with significant consultation with industry stakeholders to ensure its feasibility.

Table 7 – Procurement Strategy

PURCHASING & EXECUTION STRATEGY			
Purchasing strategy	<ul style="list-style-type: none"> <li>▪ Benchmark</li> <li>▪ Use of local workshops</li> <li>▪ Material transport optimization</li> <li>▪ Use of cost comparison sheet</li> <li>▪ Use of progressive billing for each contract</li> <li>▪ Apply holdbacks</li> <li>▪ Detailed cost breakdown</li> <li>▪ Formal tendering process</li> <li>▪ Use of templated CNE contracts prepared</li> <li>▪ Bulk material ordering (see project execution strategy)</li> </ul>	Project execution strategy	<ul style="list-style-type: none"> <li>▪ Specially timed purchasing of construction materials</li> <li>▪ Construct or rehabilitate a facility used to warehouse construction materials</li> <li>▪ Implementation of processes for inventory control</li> <li>▪ Purchase large quantity items and carry out procurement in the fall for the following year</li> <li>▪ Invite specific suppliers to negotiate further on costing and quality of materials</li> <li>▪ Prepare detailed list of materials used</li> </ul>
Approved by	CNE financial administration	Date	

Important savings can be generated through bulk and specially-timed purchasing of construction materials. As previously explained, the CNE will construct or rehabilitate a facility that can be used to warehouse construction materials. This will enable the CNE to implement processes for inventory control which in turn will play a role in maintaining adequate inventory to complete projects on time and on budget.

Identifying what to purchase will be done when the CNE completes its pilot projects (Accessible House and 1<sup>st</sup> Retrofit) in year 1 and prepares a list of all materials used.

All procurement of materials and services must comply with the CNE Financial Administration By-law and established policies. This By-law imposes approvals procedures and certification of available funds prior to contracting. Any gaps in the By-law will be filled by procedures aimed at ensuring fairness, openness and transparency in the procurement process that favour accountability and responsibility.

The CNE has established relationships with suppliers to ensure that they understand the procurement process going forward. In addition, the CNE will ensure that it always has a Plan B with an alternate supplier in the event a selected supplier is unable to respond to the NZE project needs. Where appropriate, standardized, templated contracts prepared by the CNE will be used. These contracts set out clear deliverables, timelines and the obligations on each party to favour a constructive, collaborative relationship with suppliers.

Concordia University will be assuming responsibility of procuring the technologies to be used to monitor the performance of the homes. Concordia will contribute \$25K to the purchase of equipment. The CNE is actively seeking additional partners to offset costs. If a partner is not found, the CNE will cover the costs through project funds.

#### Stakeholder Impact and Influence

There are several stakeholders in our NZE program. From residents to local businesses and outside suppliers to governments and agencies, our NZE program will impact these



stakeholders in different ways. All stakeholders can impact the success of the NZE program and influence its implementation.

Stakeholder engagement will use the principles set out in the CNE Quality Management System and be auditable within the scope of our Information Management System (ISO/IMS).

Table 8 – Stakeholder Impact and Influence

Stakeholder	Impact on Stakeholder / Stakeholder influence on NZE program
<b>Residents</b>	Most impacted stakeholders as will have opportunity to own or rent an NZE home
	Success of private homeownership program will depend on interest in investing in houses
<b>Suppliers</b>	Impacted by new business and economic development opportunities
	Influence the affordability of NZE housing which will impact success of NZE program
<b>Local Business</b>	Impacted by employment and economic development opportunities
	Influence the success and affordability of our NZE program
<b>Council</b>	Impacted by success of program in fulfilling promise to create a stronger, healthier community
	Influence the success of NZE program through budgetary appropriations and funding
<b>Government Agencies</b>	Influence stakeholder policies and programs by the findings of monitoring and studies
	Influence the success of NZE program through funding programs and policies

Through the program, Eastmain residents will be the most impacted and influential on NZE program success. The opportunity to own a home is gaining momentum in Eastmain as a means for enabling residents who have the financial capacity to move away from the social housing program and fulfill a dream shared by many Canadian - that of having one's own home. Nonetheless, the sale of NZE Private Homeownership Houses will be dependent on the interest and motivation of residents to obtain loans through financial institutions.

The NZE program will have an impact on and influence the sense of community pride. To be enduring though, it is essential that occupants of NZE homes understand the functionality of these homes and the technologies used. The goal is to ensure occupants get the most out of their homes. Consequently, every occupant of an NZE home, regardless of the type of home, will receive training and information on the operation and maintenance of their homes including,

- the use of the monitoring equipment
- cleaning and replacing HRV filters
- programming thermostats
- monitoring solar energy production
- monitoring daily energy use

#### Suppliers

Suppliers of construction materials will influence the affordability of NZE housing and the ability to sell Private Homeownership Houses in Eastmain. If the costs are excessive, this could prevent expansion of a private housing market. However, Suppliers will have an interest in ensuring success as this can lead to partnerships to provide construction materials to the CNE for its NZE program. The CNE will leverage the potential scope of its NZE program to ensure suppliers see long-term benefits in ensuring affordability.

#### Local Business

Local construction companies and tradespeople will directly impact the success and affordability of our NZE program. If the costs are excessive, this will limit the number of houses that can be built by the CNE and could put at risk its stated goal of addressing the housing crisis and building a strong, healthy community.

However, the NZE program will be very impactful on local construction companies and tradespeople. There will be substantial opportunities for local construction companies and tradespeople to specialize in assembling building components and gaining NZE building expertise, including opportunities to be licensed as carpenters, electricians, plumbers or HVAC technicians. Construction companies and tradespeople will be assured of year-round work since assembly would be done in the off-season. Moreover, the CNE has put time and effort into identifying and planning training to increase the numbers of skilled tradespeople.

#### Council

Council will influence the ability of the CNE to carry forward the NZE program. If adequate annual funding contributions are not approved for each of the six years, then the CNE may be unable to carry out all or certain projects in a given year. The NZE program will be particularly impactful on Council if it achieves the stated goal of reducing the backlog in housing and creating a healthy and strong community.

#### Government Agencies

Through their support of the NZE program, government agencies can influence its success. If funding is provided for training and certification opportunities, for green energy initiatives and for housing, this will supplement funding allocated by Council. This support will fuel immediate, short-term success but will also contribute to the sustainability of our NZE program.

Our NZE program could potentially influence government agencies' thinking and strategies on housing in Indigenous communities.

#### Communications

The CNE will continue its community engagement process including, the Cree Cafés, general assemblies, housing forums and special community meetings. This engagement process will enable the ongoing assessment of the community's NZE experience and aspirations.

In the 2019-2020 fiscal year, the CNE will also start leveraging social media as a means to receive feedback on its NZE program. This process has already started as the CNE is planning to redefine and redevelop its website so that it offers more and better information to CNE members.

The CNE is also developing a training program for NZE home occupants on the functionality of their NZE homes. This program will include one-on-one sessions delivered by a Cree Nation Government housing specialist.

A project management communication plan was prepared and will be followed in order to implement the construction phase of NZE projects according key performance indicators<sup>4</sup>, year after year through the whole project cycle.

Table 9 – Communications Strategy

Communication	Frequency	Goal	Responsible
<b>Project team</b>			
Project status report	Weekly	Review project status and discuss potential issues or delays	Project manager
Team stand up	Daily	Discuss team member activities of previous day and current day, and any obstacles	Project manager
Task progress updates	Daily	Share daily progress made on project tasks	Project manager
Project review	At milestones	Present project deliverables, gather feedback and discuss next steps	Project manager
Post-mortem meeting	At end of project	Assess what worked and what did not work and discuss actionable takeaways	Project manager
<b>Project proponent</b>			
Project status report	Weekly	Review project status and discuss potential issues or delays	Project manager
Project review	At milestones	Present project deliverables gather feedback, and discuss next steps	Project manager

### Monitoring, Controlling and Reporting

Monitoring will be essential to ensuring productivity, scheduling and timeframe goals are respected. During construction, daily site visits and inspections will be carried out by the project manager and CNE building inspector. Both will report to the CNE on the advancement of the project(s) and any issues. This process will enable the CNE to monitor

<sup>4</sup> The KPIs are described more fully in the monitoring, controlling and reporting strategies section and Table 7 below.

project deliverables and major milestones in each project and react, if required, to any issues in a timely manner.

The man hours worked, and all materials used will be recorded by an onsite foreman with respect to all labourers and construction material. Having this information is particularly important as it will ensure that the CNE can properly plan the costing and time requirements for the different housing projects.

Table 10 – Monitoring, Controlling and Reporting Strategies

Financial management			
<ul style="list-style-type: none"> <li>SAGE 300 Premium with customized Cost Accounting modules</li> <li>MS Project Manager add-ons that is auditable to the International Financial Reporting Standards (IFRS)</li> <li>Chartered accountant</li> </ul>			
Project management			
<ul style="list-style-type: none"> <li>Experienced project manager responsible for all the monitoring, controlling and reporting</li> <li>Record of worked man hours by onsite foreman.</li> <li>During construction, daily site visits and inspections carried out by the project manager building inspector</li> </ul>			
Technical monitoring			
Monitoring	Inspection		
<b>Net-zero monitoring</b> <ul style="list-style-type: none"> <li>Hygrothermal performance of the building envelope to ensure durability</li> <li>Indoor environment quality including (air quality and thermal conditions)</li> <li>Energy performance including end energy use of HVAC equipment, lighting, appliances and equipment</li> <li>Energy generation of the photovoltaic system</li> </ul>	#	Phases of inspection	When
	1	Foundation	Before backfilling
	2	Framework	Before door and window installation
	3	Tightness	Before drywall installation
	4	Exterior cladding	Before commencing exterior cladding
	5	Interior finishing	Interior finishing

The CNE has an asset management system that includes computerised preventive maintenance management system for the community, which includes the housing department.

An important part of the management plan will include the key performance indicators as presented below.

Table 11 –KPI Tracking

#	Title of Key Performance Indicator	Measure unit	Target value
1	Energy consumption of each unit	kW/h/year	Production equals consumption
2	Indoor environmental quality	Relative Humidity CO2	40– 50 % 350-1000 ppm.
3	Construction cost	\$	< 10% budget overrun
4	Number of units	Number of units/year	As planned

The logical framework below is a management tool that gives a summary of a project, in this case the Accessible House project, to describe the project objectives, methods for verification and risks on an outcomes-based methodology.

Table 12 – Logical Framework for Accessible House pilot

<b>TITLE OF PROJECT:</b> Accessible House Pilot Project		<b>Project Starts:</b> Jun 2019 <b>Project Ends:</b> Sep 2019 <b>Date Today:</b> Nov 2018
<b>DESCRIPTIVE LEVELS</b>	<b>METHODS FOR VERIFICATION</b>	<b>PROJECT RISKS</b>
<b>OBJECTIVES</b> <ul style="list-style-type: none"> <li>Design a culturally-appropriate accessible house adapted to special needs of individual confined to a wheelchair</li> <li>Develop construction details for attaining net-zero energy performance to reduce operating costs</li> <li>Determine level of solar production required to attain net-zero energy performance</li> <li>Evaluate and develop cost-effective construction techniques to ensure end costs are affordable for social housing</li> </ul>	<ul style="list-style-type: none"> <li>Design verification through interviews with special needs tenant on satisfaction and responsiveness of lay-out</li> <li>Post occupancy energy monitoring of energy consumption patterns</li> <li>Verification of net-zero status, including energy performance of the solar system, through extensive energy monitoring</li> <li>Detailed post-construction evaluation of construction costs and a cost benefit analysis of the construction system and technologies</li> </ul>	<b>OBJECTIVES VS OUTPUTS</b> <ul style="list-style-type: none"> <li>House does not meet the needs of special needs tenant, his caregiver or medical support staff</li> <li>Building system is not cost-effective</li> <li>House does not attain net-zero energy status</li> <li>Tenant does not consent to disclosure of data collected on the project and unable to collect data on individual energy use patterns</li> <li>Selected tenant refuses to move in or fails to qualify for social housing</li> </ul>
<b>OUTPUTS (Expected Results):</b> <ul style="list-style-type: none"> <li>Completed Accessible House for Eastmain resident with special needs</li> <li>Energy monitoring over two years including detailed energy consumption and energy production data</li> <li>Reporting on the net-zero energy status of the house and its potential for certification as a net zero energy building. If net zero energy status is not attained, strategies for attaining this on subsequent houses will be developed and included</li> <li>Reporting on the net-zero energy building system, including a cost/benefit analysis of the net-zero building system</li> <li>Reporting on the house design based on feedback from the tenant, his medical support and the community</li> </ul>	<ul style="list-style-type: none"> <li>Design verification through interviews with tenant on success of the design in addressing special needs</li> <li>Verification by building inspector that the house meets all code and other requirements</li> <li>Verification by an energy modeller that the design of the building meets net-zero performance</li> <li>Confirmation that all suppliers and builders/trades have been paid</li> <li>Signed lease agreement</li> </ul>	<b>OUTPUTS VS INPUTS:</b> <ul style="list-style-type: none"> <li>Tenant is not satisfied with the unit</li> <li>Local builders do not cooperate fully</li> <li>Supply chain is unwilling to negotiate effective cost saving measures</li> <li>Lack suitable lot for development</li> <li>Cost of construction is greater than available resources</li> <li>House does not attain net-zero energy status</li> <li>Adherence to all project management activities, timetables, and budgets</li> <li>Construction impacted by weather conditions</li> <li>Accessible House built according to plans and specifications</li> </ul>
<b>INPUTS:</b> <ul style="list-style-type: none"> <li>Significant community and individual engagement to develop designs that take into consideration cultural components</li> <li>Evaluation of the design must-haves of special needs tenant</li> </ul>	<ul style="list-style-type: none"> <li>Submission of bids submitted by contractors and subcontractors</li> <li>Confirmation of available funds</li> <li>Preparation and execution of contracts and financial documents</li> <li>Completion of Tenant Selection Form</li> </ul>	<b>PREREQUISITE CONDITIONS:</b> <ul style="list-style-type: none"> <li>Lot with the proper orientation</li> <li>Optimum roof angle to maximize solar performance</li> <li>Local climatic data</li> <li>Energy requirements of the home based on the building system</li> </ul>

<ul style="list-style-type: none"> <li>▪ Evaluate the building system and the capacity required for the alternative energy system (solar) through energy modelling</li> <li>▪ Develop plans for construction</li> <li>▪ Engage with supply chain to establish a detailed materials list, costing and cost saving strategies</li> <li>▪ Engage with local builders in elaboration of the building system and to identify the most cost-effective measures</li> <li>▪ Engage experienced net-zero builders and skilled tradespeople familiar with the local environment</li> <li>▪ Project management team experienced in net zero construction and cost accounting</li> <li>▪ Capital development plan</li> <li>▪ Available financial resources</li> </ul>	<ul style="list-style-type: none"> <li>▪ Confirmation of lifetime subsidy from CMHC</li> <li>▪ Confirmation of mortgage from the bank</li> <li>▪ Receipt of all plans and specifications for construction</li> <li>▪ Adoption of Council resolution</li> </ul>	<ul style="list-style-type: none"> <li>▪ Calculation of energy needs and the size of the solar array based on energy needs to meet net zero</li> <li>▪ Working drawings and detailed materials list</li> <li>▪ Approved budget and secured sources of funding</li> <li>▪ Contractual agreements that favour local capacity development</li> <li>▪ Open book agreement with the construction companies to capture actual cost variables such as materials, labour, profit and administration</li> <li>▪ Engagement with suppliers to develop ways to reduce material and delivery costs, and improve the stock of building supplies available within the community</li> <li>▪ Occupant qualifies for social housing</li> <li>▪ Project approval by Council</li> </ul>
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## Sustainability

Table 13 – Sustainability Strategies

SUSTAINABILITY
<b>STRATEGIES</b> <p>The CNE has implemented various strategies which guarantee sustainability of the NZE program</p> <ul style="list-style-type: none"> <li>▪ Taking a holistic approach</li> <li>▪ Community members and stakeholders involved in defining and designing the NZE program ensuring the project can reach its full potential and respond to the needs of the community</li> <li>▪ Laws, rules, guidelines and NZE projects discussed with suppliers and builders to ensure that they fully comprehend the framework and the expectations</li> <li>▪ Through occupant feedback, the CNE will develop new designs and floorplans</li> <li>▪ Rigorous monitoring and reporting requirements will enhance the level of trust residents have in the program</li> </ul> <p><b>Training program</b></p> <ul style="list-style-type: none"> <li>▪ Training opportunities</li> <li>▪ Hands-on training</li> <li>▪ Certification opportunities: develop new skills or improve on current skills</li> <li>▪ Business opportunities: new opportunities for employment and business development</li> <li>▪ Lead to a stronger more economically and socially viable community</li> </ul> <p>The training and capacity building programs are being developed to enhance skills of local tradespeople with respect to net-zero energy construction and retrofits. Ensuring this capacity is essential for addressing the cost of constructing housing in the community, a key component in the SCC proposal.</p> <p><b>Business plan for the development of the warehousing/building component assembly facility</b></p> <p>This is being done for the purpose of developing a local housing industry and reducing the costs associated with private homeownership. The CNE will consider expanding the type of building components assembled to include roofing systems and foundation systems. This facility may allow the CNE to build a specialized sector supplying building components to other Indigenous and non-indigenous communities.</p>

The CNE NZE program is guaranteed to be sustainable because of the holistic approach taken. From the beginning, community members and stakeholders have been involved in defining and designing the NZE program. This is essential to garnering the support

necessary for such an ambitious program, ensuring it can reach its full potential and respond to the needs of the community.

The CNE has also discussed the laws, rules, guidelines and NZE projects with suppliers and builders to ensure that they fully comprehend the framework and the expectations but also adjusting the NZE program to respond to certain realities identified by the suppliers and the builders. This step ensures that the NZE program is affordable and therefore attainable.

The monitoring and reporting mechanisms put in place by the CNE will also facilitate the NZE program sustainability. Having rigorous monitoring and reporting requirements will enhance the level of trust residents have in the program and ensure that costs are consistent for each type of housing unit constructed. Past experience has shown the CNE and Eastmain residents that housing costs can vary significantly even for similar housing types built during recent construction seasons, which undermines residents' confidence in the residential construction industry.

Finally, sustainability depends on building capacity in Eastmain. Providing training opportunities, hands-on training, certification opportunities and business opportunities will enable Eastmain residents to develop new skills or improve on skills they already have and offer new opportunities for employment and business development. This can only lead to a stronger more economically and socially viable community and ensure that the NZE program can continue.

The training and capacity building programs are being developed to enhance skills of local tradespeople with respect to net-zero energy construction and retrofits. Ensuring this capacity is essential for addressing the cost of constructing housing in the community, a key component in the SCC proposal.

To continue its NZE program, the CNE is preparing a business plan for the development of the warehousing/building component assembly facility. The CNE will consider expanding the type of building components assembled to include roofing systems and foundation systems. This facility may allow the CNE to build a specialized sector supplying building components to other Indigenous and non-indigenous communities.

As long as there is a demand for housing our NZE program will continue well beyond the Smart Cities Challenge. Our approach has been to establish Eastmain as the expert in the region on building net-zero energy houses. There is a backlog of more than 3,600 houses in Eastmain and the other Cree communities in Eeyou Istchee. This means that the CNENZE program has the potential to continue well beyond the timelines of the Smart Cities Challenge.

## CHAPTER 4: TECHNOLOGY

### Approach

The CNE's NZE program grounded on the use of smart technologies and construction technologies that are intended to enhance occupants' comfort and enjoyment of their homes and the homes' resiliency and efficiency.

While the developing the designs for the NZE houses entailed extensive community consultation, the design of the building systems and selection of the systems and technologies required to reach net-zero energy performance was carried out by a small technical team composed of experienced net-zero builders and a design consultant. The Team evaluated available technologies and construction techniques for the design of the systems to be used in the houses. Local builders were also consulted during this process to ensure that the systems and technologies identified for the project could be installed and maintained in Eastmain.

### Energy Modelling

The first stage in the design of a net-zero energy building is to identify where energy consumption reductions can be maximized (through the building envelope, housing equipment and technologies) in order to lower the energy production needed to attain the net-zero energy target. This process included

- examining wall systems used in other net-zero housing projects
- drawing from lessons learned on super energy-efficient northern housing prototypes
- drawing from lessons learned on the modelling of other net-zero energy projects
- reviewing ongoing research being carried out in this field of work, including
  - ❖ *Panelized Building Systems for Northern Multi-Unit Residential Buildings*, prepared by Cold Climate Building Inc. for NRCan
  - ❖ *Design and Construction of Multi Unit Residential Buildings (MURBs) in First Nations communities: Challenges and Opportunities*, prepared for CMHC
  - ❖ *Net-Zero Energy Housing: CMHC's Equilibrium Program*

The Team put together by the CNE conducted energy modelling on the Accessible House and the Six-Plex<sup>5</sup> as these would be the first new housing projects constructed under our NZE program.

The Team first evaluated wall systems that had been successfully used on NZE houses in Edmonton, Alberta and other locations. An initial building envelope selection was made based on the experience acquired on net-zero single-and-multi-family builds. In addition to the requirement for net-zero energy performance, the Team took into account Eastmain's climate and the need for durable, easy-to-execute solutions that deliver good

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<sup>5</sup> It should be noted that the Six-Plex is a multi-client build that offers the full range of occupancy: private homeownership, rent-to-own and social housing.



occupant comfort and moisture control. At this early stage, the potential for prefabricating the system in a small local warehouse also became a significant consideration.

HOT2000 simulations were conducted on both the Accessible House and the Six-Plex using the same building envelope details for both. Several iterations were run as part of this exercise to test different combinations of building components (See Annex B, C, D and E).

At the same time, the Team ran a HOT2000 file using electric resistance heating and hot water and set the coefficient of performance of the cooling system to 1.0. The exercise delivered some surprising results with HOT2000 showing a cooling load in every month of the year – January to December – in the 7400 heating degree day climate of Eastmain. The annual cooling demand was greater than the annual heating demand.

Table 14 – Accessible House HOT2000 Results

	HOT2000 Homesol (kWh/a) (adjusted)	COP	HOT2000 Homesol (kWh/a) (adjusted)	HOT 2000 PA (kWh/a)	COP	HOT 2000 PA (kWh/a)	IES VE (kWh/a) w/ Heat Pump COPs
Annual Heating Demand	2774	1.4	1981	2650	1.4	1893	5535
Annual Cooling Demand	8617	3.5	2462	5293	3.5	1512	94
Annual DHW	4395	2.6	1690	5562	1.5	3708	2633
Lighting, Appliances, and 7000 Misc Electrical		1	7000	6500	1	6500	6000
<b>Total Annual Energy Required</b>			<b>13134</b>			<b>13613</b>	<b>14262</b>

In both cases, the HOT2000 predictions for peak heating capacity seemed low when compared to the Team's experience with high-performance buildings in Edmonton's milder climate, while the peak cooling load seemed high.

Table 15 – Accessible House Heating and Cooling Loads

	HOT2000 (PA) Peak Watts	HOT2000 (Homesol) Peak Watts	IES VE Peak Watts
Design Heat Loss at -40C	3261	3100	5940
Design Cooling Load at 25C	1605	3600	2900

The results were far enough from expectations that the CNE commissioned ReNu Engineering to run a dynamic energy model using IES VE for comparison (See Annex F).

Table 16 – Hot 2000 IES VE Energy Modelling Comparison

HOT2000 and IES VE Energy Balance for Accessible House	HOT2000 (kWh/a) (adjusted)	COP	HOT2000 (kWh/a) (adjusted)	IES VE w/o Heat Pump COPs (kWh/a)	COP	IES VE w/ Heat Pump COPs (kWh/a)
Annual Heating Demand	2774	1.4	1981	8500	2	5535
Annual Cooling Demand	8617	3.5	2462	329	3.5	94
Annual DHW	4395	2.6	1690	6583	2.5	2633
Lighting, Appliances and Miscellaneous Electrical	7000	1	7000	6000	1	6000
Total Annual Energy Required	22786		13134	21411.5		14262
Annual output from 45 – 330-watt PV modules	15500		15500	15500		15500
Potential Annual Surplus	-7286		2366	-5912		1238

An analysis of the results did not explain the departure from expected results. However, independent longhand calculations based on the hourly weather data for La Grand Riviere, Quebec, a location with similar climatic data, favoured the IES VE results. The Team therefore chose values closer to the IES VE results to calculate the net-zero energy balance.

HOT2000 results for the Six-Plex were similarly surprising. Although these results have not been tested against the IES VE energy model, it will be possible to utilize the significant extra roof capacity of the Six-Plex to install additional solar photovoltaics if it is necessary to increase energy production in order to achieve the net-zero energy target.

The energy modelling exercise was also used to determine the other technologies and building equipment needed to achieve the net-zero energy target. This included assessing windows (fiberglass frame, triple glaze, double low e and argon filled), appliances (top 20% Energy Star performance) and lighting (LED) as well as the size of solar array required.

Based on the modelling, the roof design of the Accessible House was modified to increase the size of the solar array. Modelling also disclosed that solar energy alone would not enable the house to attain the net-zero energy target. Consequently, the Team gave significant consideration to the desirability of using an air-source heat pump versus a ground-source heat pump to ensure net-zero energy performance. Even though lower in energy performance, the Team selected the air-source heat pump because of its significantly lower installation costs and maintenance requirements.

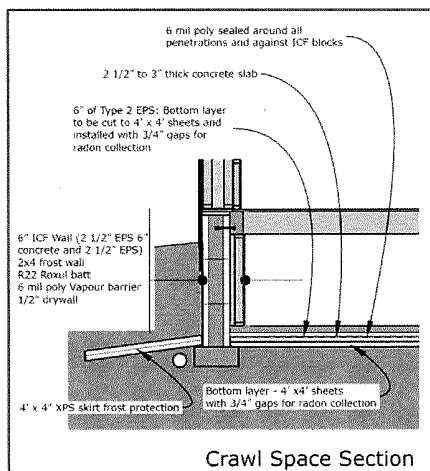
The super insulated envelope, air-tight construction, and energy recovery ventilation system allows for a 90% reduction in annual thermal energy demand intensity relative to typical construction. The significantly reduced thermal energy demand when combined with the high-performance mechanical system and on-site renewable energy generation allows for annual net zero energy consumption. This results in an annual greenhouse gas emissions savings of 861 kg CO<sub>2</sub> eq for the Accessible House as compared to standard construction techniques.

### The Building System

The selection of building materials and equipment were heavily influenced by Eastmain's remoteness and the impact this has on construction costs and housing affordability. The components of the building envelope were selected on the basis of their

- affordability
- durability
- ability to be constructed by local tradespeople
- ability to deliver the very high level of energy efficiency required for net-zero energy performance in cold climates

Figure 4. Crawlspace Detail.



Typically, houses in Eastmain have been built on full-height poured concrete foundations – a system that is known to be costly and a problem area for mould issues in many houses in the community. For this reason, there was considerable interest in exploring alternative foundation systems for houses to be constructed under the NZE program. Detailed costing and energy modelling were carried out on the use of slab on grade versus a frost-protected shallow foundation (crawlspace). While modelling showed there was very little difference in the energy performance of the two foundation types, consultation with local builders disclosed their concerns with slab on grade foundations vis-à-vis accessibility to plumbing and other household systems. Local builders also indicated that a

shallow foundation was more feasible and made it easier to install services. In addition, the Team determined that the site preparation for a shallow foundation is simpler and less susceptible to inclement weather. Based on feedback and these other considerations, the Team selected a frost-protected shallow foundation for the CNENZE program.

The frost-protected shallow foundation will consist of a 4' high, 6" insulated concrete foundation (ICF) wall on an appropriately sized concrete spread footing. The crawl space will be sealed with a continuous air and vapour barrier and included in the heated envelope. The effective insulation of the foundation wall is R-43, the under-slab insulation is R-24 and the footing skirt is R-20. To minimize the use of concrete, an expensive commodity in Eastmain, the foundation wall was reduced to 6" and the under-slab to 3".

All houses constructed under the NZE program will have a double 2x4 cellulose filled wall with a protected interior air/vapour barrier and an exterior airtight water-resistant barrier. The assembly includes a 2 1/2" interior insulated cavity to accommodate services. This assembly was chosen because it satisfies all the below criteria.

- **The system is economical**

Double stud 2x4 walls have been consistently shown to be the most economical method of building a high R-value wall, particularly when compared to the commonly used application of layering foam insulation to exterior of wall assemblies.

- **The system is durable**

High R-value walls generally means a higher risk of condensation on the inside surface of the exterior sheathing. The Team has mitigated this risk in the selected wall system in several ways. Firstly, the wall system will use a well-sealed air-vapour barrier using taped foil-faced fiberboard to substantially reduce infiltration of moisture in the walls. Air leakage in the envelope will be reduced by using the Cossela Dorken Delta Vent SA, a sealed air-tight, vapour open, water-resistant barrier. In addition, the walls will be filled with cellulose insulation, which is highly hydrophilic, to absorb and allow the slow diffusion of any remaining moisture. Diffusion of moisture will be facilitated through diffusion vents installed high in each stud cavity, which will allow any moisture that does accumulate to escape into the vented rain screen. The R-values and air tightness are such that the inside surfaces will remain well above the dew point over a wide range of temperatures thus decreasing the risk of condensation and mould in the NZE houses.

- **The system materials are easily obtained**

Other than the Delta Vent SA, the water-resistant membrane and the cellulose insulation, all the materials are readily available in Eastmain. The Delta Vent SA membrane and the cellulose insulation are easily found in the normal construction supply chain.

- **The system is buildable by the Eastmain workforce**

Assembly of the wall system is very similar to standard western platform framing, a common residential construction technique used all over North America. The use of a 2x3 wiring chase inside a sealed foil-faced fiberboard vapour barrier is currently used in a housing project being constructed in Eastmain. The use of exterior rain screens is also common.

- **The system provides excellent energy performance**

The wall system has an effective R-value of 53. Any increase in the R-value above this level would not be cost-effective because it would provide minimal additional energy savings at a comparatively high cost.

The Team selected fiberglass framed, triple glazed, argon filled sealed window units with 2-Cardinal LoE272 coatings. The roof cavity will be configured to offer a total R-80 (approximately 24") of cellulose insulation. The ceiling vapour barrier will be installed and sealed to the bottom of the trusses and supported with 2x3 strapping 24" on centre prior to building the interior partitions which will provide a chase for electrical wiring without penetrating the air/vapour barrier.

Particular attention was given to the selection of a Heat Recovery Ventilator (HRV). HRVs have been used in Eastmain homes for several years, but their performance has been inadequate. Often, the performance issues arise from improper HRV installation, or the

decision by occupants to turn the HRV off because of (a) a misperception that these contribute to high energy costs, (b) noise, and (c) the impression that cold air enters the home through the HRV. The poor performance of HRVs in Eastmain, regardless of the reasons, reflects one of the ongoing challenges to maintaining healthy indoor environments in houses across the Canadian north.

In order to address this issue, the Team worked with an HVAC consultant to design an HVAC system for the NZE program. The Team carried out a second modelling exercise using dynamic IES VE 3D building performance analysis software to confirm findings and further evaluate air conditioning requirements. Based on this modelling exercise, the Team finalized the design of the building system and construction details and made changes to the roof design to allow for additional photovoltaics. The energy modelling was then finalized using these selections (See Annex G).

### Our Technologies

A wide range of technologies will be introduced to the community through the CNENZE program. All these technologies, including new technologies not yet used in the community, are commercially available.

The technologies selected have a role in ensuring the NZE program attains the net-zero target, in monitoring and evaluating the houses and in building the houses. The Team evaluated energy saving and energy producing technologies including the building system (i.e. the design and construction of a foundation, walls and ceiling), building components (windows, doors, lighting, etc.), the HVAC system, and the solar photovoltaics.

#### Net-Zero Energy Housing

Although net-zero energy homes are not new to Canada, they are new to the Canadian North and to the Eeyou Istchee. Throughout Canada, innovations in the residential construction industry are developed locally and regionally, and innovations developed in one region must be tested in another. In each of Canada Mortgage and Housing Corporation's Equilibrium projects, for example, innovation focused on the specific combination of building systems and technologies that were used to achieve net-zero. For this reason, the Equilibrium programme targeted the development of net-zero energy housing prototypes across the country, except the north. The net-zero energy innovations also focussed on developing and refining construction processes to ensure that net-zero energy homes are competitive on a cost-benefit basis. This has been the same focus in Eastmain.

The CNE will ensure it builds capacity locally with respect to new technologies and systems being introduced into the community under the NZE program. As such, capacity building will be provided in areas such as solar photovoltaics, air-source heat pumps, energy monitoring technologies and smart home technologies.

### Net Zero Energy Technologies

The Team evaluated the energy saving and energy producing technologies required to satisfy a net-zero energy performance standard. The evaluation included selecting the materials required for the design and construction of the building envelope (i.e. foundation, walls and ceiling), the building components (windows, lighting, etc.), the design of the HVAC system and the size of the solar photovoltaic system. More specifically, the Team selected

- **Double 2x4 Wall System**

The Team chose a wall system that is used extensively in Alberta, Saskatchewan and the Yukon. The system can be used on both new construction and on net-zero energy retrofits, and it can be assembled on site or prefabricated in a small local shop. This latter characteristic was important as it falls in line with the Cree Nation of Eastmain's plan to construct or rehabilitate facility where wall systems can be assembled locally. Even though prefabricated wall systems have been used in remote communities, the CNE project to create a facility where these can be assembled in a remote community is innovative.

- **Building Components**

All the building components, including windows, doors, lighting and appliances were carefully selected to ensure that the wall systems would perform to a net-zero energy standard. The Team selected the following components for the NZE program, which will first be used in the construction of the Accessible House

- ❖ Duxton Fiberglass frame, triple glaze, 2-low E coatings, argon filled windows
- ❖ Energy Star certified LED lighting will be installed

- **Solar Photovoltaics**

As well as being essential to achieving net-zero energy performance, the solar component of the NZE program could potentially satisfy household electrical needs during blackouts. The photovoltaic system that will be used in the NZE houses will be sized according to the net-zero energy needs of each house. All NZE houses will be designed so that the necessary solar panels can be installed directly on the roof of the house.

In the case of the Accessible House, the solar array (i.e. the number of solar panels) is composed of 45 panels, each producing an output of 330 watts, to meet the energy production target of 14,309 installed watts. Electricity production from the solar array will be tied into the Hydro-Quebec electrical grid. Excess power produced through the solar photovoltaic system will be sold to the grid and bought back from the grid when supply from the system falls below household requirements.

- **Heating, Cooling and Ventilation**

ReNu Engineering designed the HVAC system to satisfy the heating and ventilation needs of the house while ensuring the house can meet the net-zero energy target. The HVAC equipment includes

- ❖ a VanEE 2400 (with an ECM fan) Heat Recovery Ventilator (HRV)
- ❖ a Fujitsu Halcyon Mini-Split RLS Air Source Heat Pump
- ❖ an AO Smith Proline XE HPTU-66N Hot Water Tank (HWT)

■ **Wood Heat**

The use of wood heat in residential applications in the North is common. Feedback from residents during the initial consultations on housing designs, many residents suggested using a backup wood heating system that will ensure houses can be heated during power outages. A Droulet Blackcomb air-tight wood stove will be installed in the Accessible House.

■ **Smart Home Technologies**

Equipment that will enable occupants to remotely monitor the operation of their homes, including

- ❖ Z-wave enabled smart home accessories that monitor home security, water infiltration, frozen pipes and carbon monoxide
- ❖ programmable smart thermostats

■ **Appliances**

Occupants are responsible for obtaining appliances. However, to assist them with this task and ensure that every component in the house contributes to the net-zero energy target for that house, the CNE will give occupants a list of recommended ENERGY STAR® appliances. The recommended appliances must be affordable while also ranking in the top 20% of ENERGY STAR® rated appliances, a performance level that was determined through the energy modelling exercise. This will include a selection of refrigerators, ranges, dishwashers and washer - dryers.

■ **Solar Generated Battery Storage**

Presently, the cost of battery storage for the loads required during the coldest winter months is prohibitive. The cost of solar panels has fallen dramatically over the past 5 years and a similar trend is starting to happen with battery storage systems. The CNE will track developments in the advancement of battery storage technology and expects that, over the next several years, the cost of battery storage will fall significantly. Battery storage will be introduced into NZE houses when the technology and the cost justify its use. When battery storage is introduced, it will be sized to provide emergency support to house operations (limited lighting, fridges, freezers) and enable occupants to survive extended power outages.

Energy and IAQ Monitoring Technologies

Net-energy zero houses constructed under our NZE program will be evaluated even after construction in order to validate their net-zero energy performance. The CNE wants to learn as much as it can from its housing projects to continually improve its housing program. The CNE will carry out extensive energy monitoring of each of the initial housing prototypes and a sampling of future NZE houses. Energy monitoring will include

- blower door testing to confirm air tightness of the building envelope<sup>6</sup>
- detailed data collection over at least one year on energy production from the solar panels
- detailed monitoring of the energy used by occupants, after occupancy, throughout the house including
  - ❖ energy consumed by the air-source heat pump and the heat recovery ventilator (HRV)
  - ❖ household energy consumption for lighting, cooking, hot water and other uses

For the purposes of the energy monitoring activities to be carried out under its NZE program, the CNE has partnered with the Concordia University School of Engineering's Centre for Zero Energy Building Studies (Concordia). With the technical team, Concordia developed a monitoring protocol and programme and identified the equipment to be used. Measuring the performance of the NZE houses and confirming that they are performing at the net-zero energy standard is a significant component of the performance measurement aspect of our NZE program.

The technologies and equipment for this work are as follows

- Hygrothermal and indoor air quality monitoring equipment including
  - ❖ relative humidity and temperature sensors to measure humidity and temperature levels inside the building and its envelope
  - ❖ wood moisture content and temperature sensors to determine the moisture level of wood-based materials in the building envelope
  - ❖ carbon dioxide sensors to measure indoor air quality
  - ❖ a compact weather station to provide local micro-climatic conditions related to temperature, humidity, wind and solar radiation
- a blower door, thermographic camera and other equipment to measure airtightness and detect any perforations in the building envelope
- energy use and production monitoring equipment including
  - ❖ a PV energy generation logging device
  - ❖ end-use energy use monitoring systems subdivided into heating, ventilation, appliances, lighting and plug loads
  - ❖ HRV temperature and flow rate monitoring to determine the HRV efficiency and operation schedule
  - ❖ data loggers equipped with backup battery power

In addition to monitoring the performance of the houses, Concordia will carry out research activities on ways to enhance the energy performance of the NZE houses that includes

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<sup>6</sup> The Cree Nation of Eastmain NZE program has adopted the "Passive House" airtightness standard (i.e. a minimum air tightness level of 0.6 air changes per hour (ACH) at 50 pascals) as it is considered by net-zero energy builders and energy modellers to be the most rigorous air tightness standard in the industry.



- installing a building-integrated photovoltaic and thermal (BIPV/T) roof system that involves
  - ❖ integrating the photovoltaic system into the roofing material of the building envelope to minimize the amount of building material used and enhance aesthetics
  - ❖ using the cavity between the photovoltaic roof panels as a duct where outdoor air can be drawn and pre-heated for the HRV indoor air intake and monitoring the increased efficiency of the solar panels from the cooling of the panels
  - ❖ using the outdoor preheated air to preheat the ventilation air system
- using the insulated thermal mass of the crawl space for thermal storage
- evaluating the benefits of using an automated shading device on windows facing south, west and east as a way to reduce heat gains and the need for air conditioning in summer.

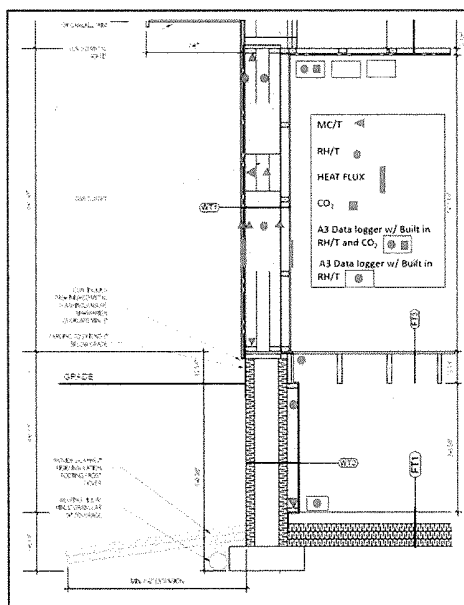
Monitoring equipment will be placed as follows.

Table 17 – Monitoring Equipment Placement

Location	Equipment
<b>Indoor</b>	A3 wireless CO <sub>2</sub> data logger w/ integrated RH/T (4 resistance channels and 3 voltage channels) CO <sub>2</sub> sensor A2 wireless data logger w/ built in RH/T and MC
<b>Wall</b>	Point moisture measurement sensor RH/T sensor
<b>Attic</b>	A3 NEMA data logger w/ integrated RH/T (4V & 4R) RH/T sensor Point moisture measurement sensor
<b>Crawl Space</b>	A3 NEMA datalogger w/ integrated RH/T (4V & 4R) Point moisture measurement sensor RH/T sensor
<b>System</b>	I3 gateway interface Building intelligence gateway computer
<b>Roof</b>	Solar radiation sensor A2 Wireless Data Logger (with built in RH/T and MC)
<b>HRV</b>	Air flow meter RTD temperature sensor RH/T Sensor
<b>Energy</b>	Watt-hour meter
<b>Outdoors</b>	Weather station

The below figure shows the location inside the house of the performance monitoring equipment.

Figure 5. Wall section sensor layout.



### Building System Assembly Technologies

Specific construction equipment and machinery will be used in the facility that will be constructed or rehabilitated by the CNE for the assembly of building components to be used in the new and the retrofitted NZE houses. This equipment includes

- carpentry and cabinet-making tools like cut-off saws, nails guns and drills
- air compressors
- A skyjack or boom truck
- a bridge crane

### Approach to Future Proofing Technologies

All of the technologies being employed in our NZE program are standard and commercially available, selected on the basis of quality, energy

performance, cost and simplicity of installation and maintenance. At some point, the equipment will need repair or replacement, however other than these normal foreseeable events, no other issues are anticipated.

The biggest technological challenge arises from the absence of any a local skilled electrical or HVAC tradespeople. This will make the installation and replacement of equipment, as well as routine maintenance and repair, very expensive. To address this issue, the CNE will focus on building capacity locally by training local tradespeople on the installation and maintenance of HRVs and air-source heat pumps. However, this is a long-term plan because HRV technicians must complete a 3-year apprenticeship.

Having chosen to use air-source heat pump technology, the CNE NZE program is vulnerable because it will have to rely on external technicians in the event of breakdowns. All houses are at risk of freezing in the event of heating system failure. However, given the low heat loss expected of the NZE houses and the inclusion of a backup wood heating appliance, these houses should be protected against freezing up and occupants will be able to remain comfortably in their homes until the heating system can be repaired.

### Legislative Compliance

All applicable codes and standards were observed in the elaboration of the housing designs. The building system meets the structural requirements of the National Building Code of Canada (the "Code"), while dramatically surpassing the energy performance targets of the Code, and complies with other applicable federal and provincial legislation.

Gauging the net-zero energy performance was done using the HOT2000 software developed by Natural Resources Canada (NRCan) and a comparative modelling using the IES VE Energy modelling software. The CNE engaged skilled energy modellers and

used accepted industry software to evaluate energy performance of the NZE houses and confirm that they will satisfy the net-zero energy targets.

The Government of Canada (GOC) is currently developing a “net-zero energy ready” model national building code as well as a model energy code for existing buildings. The CNE NZE program will satisfy the standards established in these codes and, in so doing, lay the groundwork for other Indigenous communities to create energy-efficient housing programs.

#### **Development of Standards and Guidelines**

The CNE intends to use the experience gained during its NZE housing program to create local standards and guidelines reflect the innovative combination of technologies, processes and systems that will facilitate the scalability and transferability of its program.

#### Interoperability of the Technologies

Several standards and guidelines were relied upon to develop the CNE NZE program and to design NZE houses under this program. The CNE has built on these standards and guidelines to create a program that reflects its reality and responds to its needs and capacities. The various standards and guidelines that the CNE referenced in designing its NZE program and the building systems have resulted in new combinations and interoperability between technologies.

#### HVAC Design

The design of the heating, ventilation and air-conditioning system (HVAC) for the Accessible House drew upon several standards. The air-source heat pump size was based on the HOT2000 load calculations. Heating and cooling loads will be met by a Fujitsu Halcyon Mini-Split Air Source Heat Pump. The sizing of the HRV and design of the duct system was established to meet CSA F326. Finally, rounding out the HVAC system, the CNE will integrate a high-performance, air-tight Droulet Blackcomb wood stove to provide a backup heat source.

#### Photovoltaic System

The photovoltaic array was calculated as part of the energy modelling exercise for the Accessible House and is based on the energy production requirements needed to meet the net-zero energy target. It was found that a photovoltaic array producing at least 14,309 watts is required for net-zero energy performance. The photovoltaic array will be made up of 45 panels, each with an output of 330 watts. Under Hydro-Quebec’s “Net Metering Rate Option for Self-Generators”, each of the NZE homes will be connected to the Hydro-Quebec grid and will use net metering. Under the scheme, the Hydro-Quebec grid will become the “storage system” for excess electricity produced by the photovoltaic system and “sold” to the grid. The amount of energy produced will be deducted from the amount used in calculating the household electricity bill.

### Accessible Design

The Accessible House features were designed to meet the accessibility requirements of the Code and applicable legislation. To create the Accessible House design the CNE drew upon the feedback received during community consultations, including caregivers and first responders. Guides and standards referenced in the design of the accessibility features of the Accessible House include the Canadian Standards Association "Accessible Design for the Built Environment" (CSA B651-12) and CMHC's "Accessible Housing Design Guides" (See Annex H).

### Scalability and Replicability

The CNE NZE program is shown to be scalable. The designs and technologies are easily adaptable to respond to the different needs and capacities. The CNE has developed a scalable housing program that offers various sizes of housing to a variety of clientele.

The CNE plans to develop a guide setting out the processes for implementation of future net-zero energy initiatives that can be used as a framework by other Indigenous and non-Indigenous communities.

### Technology Partners' Roles and Responsibilities

To design and develop its NZE program, the CNE built a team of skilled designers and technicians with extensive experience in the design, construction and evaluation of net-zero energy housing including

- **Bill Sample, NORdec Consulting and Design**

Bill led the extensive community consultations carried out to gather input on the design of our NZE program housing prototypes and designed the Six-Plex, the Accessible House, the Cree Elders House, the Private Homeownership unit and the Starter House. Bill led the technical team that carried out the evaluation of the construction details, the net-zero energy modelling exercise, and the selection of all materials and equipment to be used in our NZE program. Bill developed the working drawings for the project and will assist in developing the capacity-building program for the NZE project.

- **Peter Amerongen**

A leader in net-zero residential construction, Peter led the design of the building system and the net-zero energy evaluation. He identified and selected the materials and equipment required to achieve the net-zero energy and will help with the design of the capacity-building and training program for net-zero building techniques and the assembly facility.

- **Homesol Building Solutions**

Homesol Building Solutions Inc. is an expert in green building and energy design consulting, energy modeling, ratings, labels and has verified building performance solutions for projects throughout North America. It was responsible for the energy modelling and evaluation of the net-zero energy status of the Six-Plex and the

Accessible House. Homesol assisted in the development of the construction details and the selection of mechanical equipment.

- **Concordia University**

Concordia University's Centre for Zero Building Studies is responsible for the energy monitoring program that will commence with the Accessible House and the NZE retrofit. This will include a breakdown of household energy use patterns including heating, cooling, hot water, appliances, monitoring energy production of the photovoltaic array, monitoring energy production of the air-source heat pump, and monitoring indoor air quality by tracking of CO<sub>2</sub> and humidity levels in the house (See Annex I).

- **McGill University**

McGill University's Institute of Health and Social Policy will undertake a research project to develop and implement culturally-appropriate research methodologies for monitoring and assessing the results of the NZE housing program at every step. This will include studying the links between housing and individual, family and community well-being (See Annex J).

- **CMHC**

Canada Mortgage and Housing Corporation provided financial support for the community engagement process and funding for the McGill University research project. In addition, has programs to support ongoing monitoring and evaluation of NZE houses as well as capacity-building. CMHC has acknowledged the importance of the social, financial and technical innovations of our NZE program and expressed interest in the research being carried out (See Annex K).

- **ReNu Engineering**

ReNu Engineering is an Edmonton company specializing in building performance and energy efficiency. ReNu was responsible for conducting a comparative analysis of different HVAC options and developed the design and conceptual drafting of construction drawings for the selected HVAC system. ReNu also carried out a second energy modelling analysis on the Accessible House to confirm the net-zero energy target using the dynamic IES VE 3D building performance analysis software.

- **Cree Human Resources Development (CHRD)**

CHRD has funding programs for capacity development that are available to the Cree Nation of Eastmain. CHRD has already contributed financially under its Youth Program that allowed three CNE youth to work with the Project Management Team. The CNE will continue to apply for CHRD funding throughout its NZE program.

#### **Accessibility and Usability of the Technologies**

The technologies employed in our NZE program will have a direct and indirect impact on the various stakeholders who will have access to the technologies and the data collected by these technologies.

Builders and local tradespeople will be trained in net-zero energy building systems. By participating in the construction of NZE houses, builders and tradespeople will gain first-hand knowledge and net-zero experience. The repetitive application of the net-zero energy construction techniques should lead to a reduction in housing construction costs.

The HVAC Contractor will be introduced to the installation and use of air-source heat pumps and high efficiency HRVs. The air-source heat pump was selected because of its usability and ease of installation and maintenance.

Occupants will be introduced to and be given assistance on the use of the different technologies used in the NZE program. More particularly, occupants will learn to use programmable thermostats and smart home accessories to monitor home security, detect water leakage and track carbon monoxide levels, and online tracking of their energy consumption patterns and energy production through a dedicated website.

If occupants give their consent, the Housing Department may provide on-site support for remote monitoring carried out on the houses such as rebooting computers, changing batteries in the monitoring equipment as needed and mitigating risks. Furthermore, the Department may have access to monitoring equipment and data collected including energy monitoring data, production data and will have access to material cost breakdowns.

#### **Identification of Risks**

##### Data Security

To ensure data integrity, the NZE program data collection system will be able to operate as a stand-alone system to protect the security and integrity of the data without requiring third party analytics software.

There are measures that can be implemented to ensure data integrity and protect it from unauthorized access. Data collected will be communicated to a cloud-based server for analytics and will use a Secure Socket Layer (SSL) to maintain an encrypted link between the web server and browser. Custom access levels to the data can be given such as, read/write to authorized personnel and read only access for open data sharing.

## **CHAPTER 5: GOVERNANCE**

Good governance practices and guidelines are essential to ensuring that government actions are fair and responsible and carried out in an open, transparent and accountable manner. The CNE adheres to good governance principles.

#### **Governance Frameworks and Strategies**

The CNE was a signatory to Canada's first modern-day treaty and a number of subsequent agreements reaffirming its right to self-government and to control its land and

assets. These agreements together provide long-term predictability of funding to the Cree Nation of Eastmain.

Council is the local government authority and has responsibilities set out in the Agreement on Cree Nation Governance Between the Crees of Eeyou Istchee and the Government of Canada and the Constitution of the Crees of Eeyou Istchee, as well as under the Cree laws enacted pursuant to these instruments.

#### ISO/IMS

According to the World Bank, good governance “entails sound public sector management (efficiency, effectiveness and economy), accountability, exchange and free flow of information (transparency), and a legal framework for development (justice, respect for human rights and liberties).”<sup>7</sup> In accepting this definition of governance as one of the underpinnings of community success, the CNE has integrated the spirit of the Smart Cities Challenge. If the CNE promises to adhere to the principles of good governance, it must systematically govern itself. Its strategy, direction, and oversight will only be as effective and as functional as the management systems used to deploy them.

Its acknowledgment of the need for sustainable programs, capable of providing value to the community over time, incited the CNE to develop its ISO Integrated Management System (ISO/IMS) to manage the future growth and challenges of the community. The ISO/IMS provides clear direction and continuous feedback to decision-makers and sets a foundation for trust in the operations of the Cree Nation of Eastmain.

Cree Nation of Eastmain’s Smart Cities Challenge governance approach is to integrate the NZE program into the design and development of its ISO/IMS in order to capture its ability to deliver reproducible quality outcomes with a measured degree of reliability. Lessons learned throughout the project, captured as best practices, will be systematically incorporated into NZE program documentation.

Because it is composed of system “modules”, the ISO/IMS processes can all be captured and prioritized and implemented in a phased approach to help ensure the appropriate controls, such as transparency, privacy, and accessibility are in place as and when needed.

Through an iterative development approach that sets up the Smart Cities project processes to be executed, together with the capture of their relative performance for continuous improvement purposes, CNE will be developing a turn-key model of not only the housing solution itself, but also of the governance and management systems models that enable them to be sustained.

CNE’s governance framework model employs the discipline and traceability of three distinct management systems:

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<sup>7</sup> United Nations Economic and Social Council Committee of Experts on Public Administration Fifth session New York, 27-31 March 2006 Agenda item 5 —Compendium of basic terminology in governance and public administration E/C.16/2006/4 *Definition of basic concepts and terminologies in governance and public administration*

- ISO 9001 Quality Management System (QMS) to ensure that CNE meets its community members' infrastructure needs as well as of the SCC solution itself
- ISO/IEC 20000-1 Service Management System (SMS) for the IT services supporting CNE and SCC
- ISO/IEC 27001 Information Security Management System (ISMS) for the protection and monitoring of CNE's information, data, privacy, security, and accessibility.

These systems are enabling CNE to plan, deliver, verify and improve on projects, programs and services. Under the ISO/IMS, the CNE is required to capture stakeholder needs and requirements when designing and developing of any new initiatives, like the Smart Cities Challenge, by using best practices and continuously seeking opportunities for improvement. As an audited, documentation-based system, the ISO/IMS will provide substantiated evidence of the project, from start to finish, making it packageable, transferable and reproducible.

Integrating an ISO/IMS into the SCC is not only novel and innovative in terms of its application of use in this context, but also in terms of its ability to enable CNE to capture and replicate this project to share with other communities. This unique approach will also enable an appropriate level of oversight over the SCC work processes to ensure success at every stage of its implementation. This level of risk management and pursuit of continuous improvement serves as a predictive indicator of failure-causing events, which in turn, makes them easier to avoid.

An investment into a systematic approach at capturing future value in best practices that have been developed within a local community can multiply the beneficial effect across other communities, with structure, discipline, accountability, transparency and quality housing.

#### Cree Laws and Policies

In this respect, the CNE must comply with the procedures set out in its financial and administrative laws with respect to expenditures and contracting. Budgets must be prepared by the Treasurer and approved by Council. Monies to be allocated to services and programs must be included in the budgets or supplementary budgets and approved by Council resolution. With the exception of borrowing for housing, long-term borrowing must be approved by Council and ratified by the electors of the Cree Nation of Eastmain.

Each year, the CNE is subject to audit of its financial statements. The auditors conduct an extensive examination of Council resolutions, contracts, purchase orders and payments to ensure that spending is done in compliance with the Cree law.

Activities under our NZE program that involve an expenditure of funds must use administrative and financial management tools that ensure the good financial management of resources. These tools include templated contracts, purchase orders, and budgets and financial statements on a project-by-project basis.



### Project Management

Under our NZE housing program, Council and the Project Management Team will review program needs and make decisions on project funding on an annual basis and as needed to respond to program requirements. The Project Management Team will have an obligation to report to Council and to the members on the use of Cree Nation of Eastmain's NZE program contributions. All such reporting will be done at public meetings to ensure the transparency of the NZE program activities and enhance the accountability of the Cree Nation of Eastmain.

Our NZE program governance framework will be made up of a two-tier project management system. One tier will manage the NZE program and provide technical support, the other will manage project construction activities and costs. The purpose of this structure is to minimize risks and improve chances of success. All construction projects will be supported by a team of experts making sure that construction can be completed on time and on budget.

The Project Management Team will be responsible for

- obtaining funding for the NZE program and construction activities
- carrying out all design review and changes
- evaluating and approving all change orders
- overseeing all aspects of the NZE program.
- evaluating the project to ensure compliance with building code and other standards
- tracking all materials, orders and costs as well as labour costs
- developing the capacity-building program and overseeing its implementation

The construction project manager will be responsible for

- tendering and contracting with contractors
- establishing and undertaking a material inventory control system
- undertaking the assembly of building components to avoid seasonal impacts
- ensuring construction projects are started and completed on time
- monitoring contract performance
- providing proper site supervision
- controlling costs

### **Partners and Resource, Capacity, Roles and Readiness**

The CNE will work closely with its partners Concordia University, McGill University, Renu Engineering, Canada Mortgage and Housing Corporation (CMHC) and Cree Human Resources and Development. The partners' roles in our NZE program is determined by their respective sphere of activity and expertise. Each of our partners has the capacity needed to contribute to the success of our NZE program.

Concordia University will carry out all the quantitative data collection as well as the storage and protection of this data. McGill University (McGill) will collect qualitative data relating to occupant experience and will also be responsible for the storage and protection of this data. McGill will ensure that data it collects under our NZE program is anonymized prior to disclosure to our program partners or any third party

CMHC has approved a three-year project for the CNE McGill to carry out qualitative research on the occupants and resident's response to the NZE houses and NZE retrofits. The Contribution Agreement has been approved in principle with wording relating to intellectual property rights and privacy to be finalized.

#### Concordia University

Concordia University Department of Civil and Environmental Engineering's Centre for Zero Energy Building Studies (Concordia), is one of the leading research institutes on net-zero energy buildings in Canada. Dr. Andreas Athienitis, Director of the Centre and Scientific Director of the Natural Sciences and Engineering Research Council of Canada (NSERC) Smart Net-Zero Energy Buildings Strategic Network, is known at home and abroad for his work promoting net-zero energy buildings. His extensive work in this area has enabled Concordia to build significant capacity in this field, with several professors and graduate students specializing in net-zero energy and solar buildings. Concordia will carry out extensive field monitoring of the houses built under the CNE NZE program which will serve as a model for a framework that can be replicated in other northern communities. Field testing will be carried out by Concordia graduate students, supported by Dr. Athienitis and Dr. Hua Ge.

#### McGill University

Qualitative research on our NZE project will be carried out by the McGill Department of Geography Institute for Health and Social Policy's Place, Health and Well-being Research Group. Led by Dr. Mylene Riva, Assistant Professor at the Institute and the Department, the research group will examine the social and environmental determinants of health and well-being among Indigenous and non-Indigenous peoples. The extensive field research to be carried out in Eastmain, will build upon a previous project carried out in Nunavik on Housing, Health and Well-being in the Arctic. The research activities will be undertaken by graduate students from the Department under the supervision of Dr. Riva. The research work will examine the links between housing and individual, family and community well-being.

Figure 6. RACI Matrix

Project Deliverables	Council	<div> <div>CNE</div> <div>NORdec Consulting</div> <div>Ashint Consultants</div> <div>Concordia University</div> <div>McGill University</div> <div>General Contractor</div> <div>Renu Engineering</div> <div>CMHC</div> <div>CHRD</div> <div>Training Institutions</div> </div>									
		Project Management Team		External Resources							
Net Zero Housing Program Strategy	I	A/R	C						C	C	
Net Zero Housing Program Design	I	A/R	C	C	C	C	C	C	C	C	C
Net Zero Housing Program Implementation	I	A/R	C	R/C	R	R	R	R	I	I	I
Net Zero Housing Program Change Management	I	A/R	C	C	C	C	C	C			
Project Charter	A/R	C/I									
Acquisition of financial resources	I	A/R							C	C	
Funding approvals	A/R	C									
Housing unit design review and changes	I	A	R	R	I	I					
Financial Management	I	A/R					R				
Quality Management		A/R	C	C			I				
Supplier /Contract Management	I	A/R					R				
Risk Management	I/C	A/R	R	R	R	R	R	R			
Ensuring that all standards and applicable codes are followed		A/R					R				
Project change orders		A/R	C	C			I				
Project oversight		A/R	R	R							
Resource control for Pilot		I	C	A/R							
Material negotiations		A/R		R							
Capacity building and training		A				R	R	R	C	C	R
Tendering and issuing of contracts							A/R				
Hiring of trades and subtrades		I	I	I			A/R				
Site supervision							A/R				
Construction cost control		I	I	I			A/R				
Material Inventory Control		A/R	C	C							
Assembly of building components		C	C	C			A/R				
Collection and monitoring of qualitative data		I	C	I		A/R					
Collection and monitoring of quantitative data		I	I	I	A/R						
Protection & privacy of quantitative data	R	R	R	R	A/R						
Protection & privacy of qualitative data	R	R	R	R	A/R						
Approval for public release of information	A/R	C									

### Control over Sensitive and Personal Data

The CNE and its partners are all responsible for compliance with data protection and privacy obligations.

Data collected in the context of our NZE program will remain the intellectual property of the Cree Nation of Eastmain. The public disclosure of any such information requires the Cree Nation of Eastmain's prior consent.

Any disclosure of information collected under the auspices of our NZE program must first be anonymized and all personal identifying information removed. The CNE intends to enter into memoranda of understanding with its partners, and other person involved in our NZE program, to ensure compliance with the Personal Information Protection and Electronic Documents Act (PIPEDA).

### Risk Management

Below are some of the risks relating to governance that have been identified along with the steps take to avoid these risks or to remedy them.

Table 18 – Risk Identification, Prevention and Correction

Risks	Preventive Measures	Corrective Measures
Changes in Council priorities that negatively impact funding commitments for NZE program	Keep Council informed of benefits of NZE program and its importance	Seek additional investment and financing.
Changes to government policies		Adjust the project according
Contract disputes	Ensure effective supplier/contract management is in place	Bring the interested parties together to mediate a solution
Partner withdrawal from the program	<ul style="list-style-type: none"> <li>▪ Good leadership</li> <li>▪ Healthy communications to identify issues early</li> <li>▪ Effective engagement</li> </ul>	Establish new partnerships

## CHAPTER 6: COMMUNITY ENGAGEMENT

### Approach to Engagement

In order to enhance the success of its Housing programs, the CNE is working toward increasing the residents' understanding of its Housing Policies and programs so that they can fully take advantage of these. The Housing Policies are currently being reviewed and during this process, ongoing discussions, information sessions and workshops will be used to educate and gather input from residents on these policies. Community engagement has always been the preferred method for the Housing Department to obtain feedback and ideas from Eastmain residents. Key strategies that we have used to support the Cree Nation of Eastmain's efforts to inform and educate residents include

- developing a Tenant Guide Booklet to be provided to every household
- holding information sessions and workshops for community members on Home Ownership and Tenant Responsibility
- doing monthly Radio Talk Shows on Housing matters
- organizing CMHC-sponsored workshops for tenants and maintenance workers on mould issues, indoor air quality, basic home maintenance, and Section 95 Housing.

Cree Nation of Eastmain's Sustainable City Challenge Statement, "Improving Community Well-Being", evolved from a series of meetings between Chief and Council and the CNE Housing Committee, and numerous informal and formal discussions with elders and other residents. During this engagement process, the CNE became acutely aware of the ongoing issues that residents have with housing designs, construction standards and the operations of mechanical systems. As such, broader consultation was carried out on these issues at community meetings, design workshops and home visits. Community events included

- Workshops/Charrettes (2017 and 2018)
- Annual General Assemblies/Cree Café (2017 and 2018)

- Meetings/consultations with users (tenants and occupants), and professionals (caregivers, first time responders etc.)
- Special Events
  - ❖ Housing Forum (2018)
  - ❖ Builders Forum (2018)

Consultations, home visits and workshops were held in June 2017 with the focus of gathering residents' ideas on the design of various housing prototypes. This initial consultation process was followed up by workshops in January 2018 where preliminary plans for the Cree Elders House, the Starter House and the Six-Plex were presented, and residents were invited to comment on these. Consultation was held in the summer of 2018 on the design of the Accessible House.

#### Annual General Assemblies

The CNE holds regular Annual General Assemblies (AGAs) to receive members' ideas such as topics on ways for improving housing in the community. Break-out groups during the AGAs allow smaller focus groups to explore questions in greater depth.

At the 2017 meeting, the Housing Department presented designs for a Cree Elders' House (Annex L), an Elders' Community (Annex M) and a Starter House (Annex N). A housing booth was set up so members could review the preliminary plans, ask questions and comment on the house designs. The CNE received positive feedback on the designs. Members also expressed their desire to see more durable and energy-efficient homes built in the community. The incorporation of culturally-appropriate features, the installation of solar panels and the use of thicker, better insulated walls were a starting point for further discussions around making houses more sustainable.

#### CNE Housing Forum

In February 2018, as a continuation of the community engagement process, a Housing Forum, with a focus on obtaining members' input on CNE housing needs and the Smart City Challenge, was held. The Housing Forum was devised to enable the sharing of information and gather members' input on the Smart Cities Challenge, the Cree Nation of Eastmain's proposal to create an NZE Housing Program and the preliminary design for a culturally-appropriate NZE Six-Plex.

Reflecting a trend that is emerging in many northern Indigenous communities, multi-unit housing is being promoted as a means to reduce land development and construction costs, improve energy efficiency and enhance the sustainability of the community. The Housing Forum gave members information and a chance to exchange ideas on

- the Smart Cities Challenge
- the proposed NZE housing program
- energy efficiency targets, technologies and the building systems used to reach these targets

- lessons learned from other successful NZE projects in Canada
- the challenges facing remote northern communities in attaining NZE targets and their relationship to the traditional lifestyles
- housing design ideas and principles with respect to the proposed culturally-appropriate Six-Plex
- community resiliency and the impact NZE housing can have
- the importance of capacity-building and training to create a sustainable housing program
- the cost/benefit of an NZE program for the Cree Nation of Eastmain
- smart home technologies
- housing maintenance
- views of local builders on NZE building systems

After significant discussion, the CNE members adopted a Resolution supporting CNE's participation in the Smart Cities Challenge. (Annex O) This included the implementation of an NZE Housing Program and the construction of an NZE Six-Plex (Annex P). After the Resolution was adopted, community members were divided into four discussion groups where they provided more detailed input on the Smart City Challenge and the CNE NZE Housing Program.

#### Cree Cafes and Targeted Consultation

The ongoing use of the Cree Cafés during AGAs and community meetings has led to design innovations and gives residents a means to voice their ideas and share their experiences in respect of housing. It was through this process that the net-zero housing initiative was developed. Input was also sought from service providers in the health care and public safety sectors and, with the ideas of residents, informed the development of several culturally-appropriate housing designs that reflect on the Cree way of life.

Cree Café focus groups broke out during the Housing Forum to discuss questions related directly to the Cree Nation of Eastmain's development of the Smart Cities Challenge proposal. The discussions at the Cree Café confirmed strong support for a net-zero energy housing program, improvement of housing design, durability and operating cost. In particular, there was significant support for

- more design options for homes that will give residents greater opportunity to participate in housing design and that meet the needs of different members
- exploring pre-fab construction that would give the CNE more control over the quality of construction and lead to the creation of more local employment
- home monitoring to help protect homes against break-ins and equipment breakdowns when members are out on the land or travel down south.

The CNE recognized early on during the Smart Cities Challenge community engagement process, that engaging with local builders, to get their input and support, was essential to the success of the project. As part this process, an initial consultation session was

facilitated by design and technical consultant, William Semple, and net-zero energy consultant, Peter Amerongen, in October 2018. The presentation made to local builders during this consultation session provided information on house designs, the proposed building system, costing, capacity-building issues and the targets for the project. Local builder consultation sessions were used to gather feedback and initial impressions of the NZE program and the challenges and opportunities it would present.

#### Builders' Forum

Building on the first local builder consultations, an Eastmain Builders' Forum was held in December 2018. The Forum brought together local builders and tradespeople, housing inspectors and representatives from the construction materials supply chain with a view to ensuring the comprehensive representation of the building industry on the NZE program. The CNE took the opportunity to affirm the importance of the participation of local builders and suppliers to the success of the NZE program. More particularly, they were informed that a collaborative and cooperative approach must be taken if the NZE program is to address the ongoing issues with residential construction costs in Eastmain. This further reflected the CNE view that success and sustainability of its NZE program required a holistic approach and the buy-in of all stakeholders.

The Builders' Forum included an overview of the Smart Cities Challenge and the Cree Nation of Eastmain's proposal to establish a net-zero energy housing program to respond to its housing shortage. Participants were presented with the house designs and the proposed building system and technologies.

Builders and industry representatives in attendance expressed strong support for the NZE program and its goals of constructing more, better-built and resilient housing, creating employment and economic development opportunities and building housing industry capacity in Eastmain.

#### Eastmain Partners Meeting – Concordia University

In January 2019, the CNE and its partners and interested government agencies participated in a two-day meeting and planning session at Concordia University. In attendance were potential funding agencies, research partners and the CNE Smart Cities Challenge team. Presentations included

- CMHC northern housing research projects
- NRC northern research projects
- McGill University social northern housing research in Nunavik
- Concordia University Centre for Zero Energy Building Studies research projects and the NSERC research network

The session also

- developed linkages between the social and technical researchers and research projects

- provided an overview on the Eastmain Smart Cities Challenge proposal and long-term objectives of the community
- provided an opportunity to contribute to the development of the research objectives of the research partners and input into the development of the final proposal

#### Community Engagement Plan – Project Implementation

As part of its ongoing consultation process with its members and to support the Smart Cities Challenge initiative, the CNE will carry out ongoing consultation with members and other stakeholders. In addition, the CNE will share NZE program progress and outcomes, and continue to obtain feedback from residents on the NZE program, including the important cultural aspects addressed in the design of the houses. The Cree Nation of Eastmain, in partnership with its research partners, will launch initiatives to gauge the impressions of residents living in NZE houses, with respect to their designs, and the roll out of the construction of NZE housing in the community.

To ensure that Indigenous values, traditions and experiences guide the research, the research project will be conducted according to the principles of Indigenous Research Methodologies (IRM), using research methods for community-based participatory research (CBPR) to engage with Eastmain residents. Using the participatory research model, the McGill University research team will work in collaboration with the CNE. The partners will contribute to the various phases of the research, especially in defining the research questions and objectives, developing the methodologies, data collection and analytical processes, and disseminating the research results. Participatory research will include validation steps at every stage of the NZE program.

For this research to be culturally-sound and grounded in Cree lived-experience, it will engage with Cree worldviews, knowledge and idioms, with a focus on the central role that relationships play in Cree culture. The McGill University research team will conduct one-day workshops with groups of 6 to 12 participants, ensuring representative demographic groups that include women, men, elders and youth. Following the IRM principles, talking circles will be used as a culturally-appropriate way to exchange ideas and bring together varied perspectives on complex subjects. Talking circles will allow the McGill University research team to obtain a comprehensive understanding of the Cree perspective of relationships and how these are impacted by housing conditions and design, and how these housing conditions and designs impact individual, family and community health and well-being.

The IRM principles will guide the research aspect of the NZE program, and data collection methods will be carried out in collaboration with the CNE. The research project will document

- housing conditions and well-being of individuals, families and of the community at “baseline”; i.e. before the implementation of the NZE housing program
- the change in housing conditions, after the implementation of the NZE housing program (i.e. impact assessment of the NZE housing program)



- the impacts on occupants arising from the change in tenancy and occupancy of a new NZE home or NZE retrofitted unit
- culturally-appropriate and NZE design vs. housing presently available
- NZE retrofitting houses vs. moving into a newly-built house, vs. moving into an existing house in the community made available when other residents move into private homeownership houses

#### Eastmain Community Housing Meeting (May 2019)

Once the winners of the Smart Cities Challenge is announced and prior to launching the NZE housing program, the CNE will hold a special community meeting and information session. The meeting will provide information on the proposed roll-out of the NZE program including

- a detailed overview of the Cree Nation of Eastmain's final proposal for the Smart Cities Challenge
- the final designs of the houses to be constructed under the NZE program
- a detailed overview of the NZE construction projects to be carried out in 2019
- the proposal respecting the establishment of a warehouse/building component assembly facility
- the project management plan and the proposed timelines for the NZE program

#### Eastmain Annual General Assembly (August 2019)

At its 2019 AGA, the CNE will provide an update on the results of the Smart Cities Challenge and the roll-out of NZE housing program. A presentation of final drawings and 3-D models of the Accessible House being constructed at the time of the meeting, and the Six-Plex to be constructed in 2020. The information on these construction projects will include (a) the building system, (b) the plans for local assembly of building components, and (c) the net-zero energy monitoring of the projects. The AGA will serve to collect members' feedback on

- proposed project roll-out and construction timelines
- capacity-building and training components and their impacts on local employment
- proposed project monitoring and data collection

#### Builders Meeting/Workshop (Autumn 2019)

A one-day interactive workshop will be held late in Autumn 2019, after the completion of the Accessible House. The session will include those builders and tradespeople that worked on the Accessible House project. The workshop will consider and make recommendations on

- building system costs, ease of construction, changes or alterations
- pre-assembly of the wall system

- integration of the trades into the production of the house
- evaluation of the material ordering/storage
- capacity-building and training

#### Eastmain Community Housing Forum (Autumn 2020)

A one-day Housing Forum will be held in Autumn 2020, after construction has commenced on the first Six-Plex project. The Forum will allow the CNE to get members' impressions on the design of the NZE houses, share results of year-1 monitoring and inform them of the progress of the warehousing and building component assembly facility.

The extensive community engagement initiatives that the CNE has taken on with the NZE program are reflective of the community's ongoing commitment to engage and consult with its residents on important community issues like housing. While the CNE's aspiration to combine the construction of multi-unit homes with NZE performance, culturally-appropriate designs and features is unique and ambitious, the CNE believes the project is achievable – and that extensive community involvement in the project is an important component in ensuring its success.

## **CHAPTER 7: DATA AND PRIVACY**

### **Preliminary Privacy Impact Assessment**

The CNE prepared a Preliminary Privacy Impact Assessment (PIA) showing the consideration it gave to the collection, use and flow of information (See Annex Q). The PIA was sent to the Office of the Privacy Commissioner of Canada for comments. These comments<sup>8</sup> have been considered in the elaboration of the Cree Nation of Eastmain's activities that touch data protection and privacy.

### **Compliance of Data Management Plan with PIPEDA**

#### Privacy and the NZE Program

The NZE housing program will involve the collection, use and retention of personal information, of varying degrees of sensitivity. The information collected includes inter alia the below information (Table 19)

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<sup>8</sup> The comments are attached together with Annex R.

Table 19 – Information Collection and Purposes

Information	Purpose
Name	Identification
Family Size	Allocation of appropriate housing
Address	Identification
Total household income	Determine rent
Health conditions (if any)	Determine special housing needs
Rental arrears	Determine eligibility for new housing and/or subsidies
Loan information	Confirm ability to pay and eligibility under Private Homeownership Program
Credit rating	Verify capacity to pay rent

In collecting this information, the CNE intends to comply with fair information principles.

Pursuant to the Agreement on Cree Nation Governance Between the Crees of Eeyou Istchee and the Government of Canada and the Constitution of the Cree Nation of Eeyou Istchee, the CNE must establish access to information procedures with respect to information in its control. The CNE is implementing a process for classifying information and establishing the level of protection required.

Presently, CNE agreements with suppliers, contractors and consultants contain provisions respecting confidentiality and, with respect to service providers, retention and disclosure restrictions.

With respect to the NZE housing program, both Concordia University and McGill University<sup>9</sup> are subject to their own privacy policies and to the Quebec Act respecting access to documents held by public bodies and the protection of personal information, CQLR ch A-2.1. Concordia University's Office of Research will provide guidance to the CNE to ensure research conducted under our NZE program complies with all applicable legislation and policies. A Summary Protocol Form will be submitted to the Concordia University Human Research Ethics Committee (UHREC) to obtain a Certificate of Ethical Acceptability before undertaking any monitoring of any occupied houses. Annual progress reports will be submitted to UHREC to obtain approval of the research privacy and data protection protocols throughout the monitoring phase.

A consent form that contains a plain language description of the project and any possible privacy risks will be given to occupants as part of the consent process.

#### Methods of Data Collection, Analysis and Storage

The CNE has held public meetings with its members to design the NZE housing program. As well, housing continues to be tabled at public meetings. Members are informed regularly of the information requirements for housing in general, which includes much of the information set out in Table 19.

<sup>9</sup> McGill University is subject to the Tri-Council policy Tri council policy statement  
<http://www.pre.ethics.gc.ca/eng/policy-politique/initiatives/tcps2-eptc2/chapter9-chapitre9/>

New regional policies will be coming into force and the NZE housing program will involve further consultation with members to ensure comprehension of the additional information requirements of the regional policies. The CNE will also inform members of the type of information that will be required and the purpose of collection of information under the NZE program. Prior to the collection of information, the individual is informed of the reasons for which the information is collected, how it will be used and whether it will be shared with other organizations.

Table 20 – Non-personal Information Collection and Purposes under NZE Program Monitoring

Information	Purpose
House Model/Size	Research
Energy use	Research
Air quality	Research
Comfort	Research
Satisfaction	Research

#### Collection

The CNE Housing Administrator will collect only that information required for the purposes of administering the NZE housing program and complying with the CNE housing policies and the policies to be adopted by the Cree Nation Government. More specifically, the CNE must, in order to administer its NZE program, be able to identify the occupants, verify their eligibility under the programs and capacity to pay and understand the health conditions, if any, that may be determinative on the type of housing unit allocated to the occupants.

The information collected by Concordia University and McGill University is necessary to enable the analysis of the net-zero energy technologies, construction systems and to measure the success and individual satisfaction with the NZE homes to be built in Eastmain.

#### Use, Disclosure and Retention

The information collected by the CNE will be used exclusively for the purposes of administering its housing program; i.e. allocating housing units, fixing the rent to be paid and establishing maintenance schedules, amongst others. Information collected by Concordia University and McGill University will be used solely for research purposes.

The information collected by the CNE will not be disclosed to third parties except as required by policy. Disclosure to the Cree Nation Government may be required under CNG policies and funding arrangements with the CNE, so that the occupant or the CNE can access subsidies for housing. Otherwise, the CNE will not disclose information collected from members for the administration of its program to third parties.

The CNE will however collect information generated by the sensors and data loggers. This information will be anonymized and then transmitted to Concordia University for the purposes of monitoring the performance of the NZE houses. McGill University will be responsible for collecting information directly from occupants of NZE houses and Eastmain residents with respect to the qualitative study it will conduct.

The information collected under this study will not be disclosed to third parties, including Cree Nation of Eastmain, until it has been anonymized.

Depending on the housing program, and the type of information collected, information collected for the purposes of administering the housing program is held for the duration of the housing project (i.e. until final payment) or until it is no longer relevant (such as a change of occupant).

McGill University may retain information for up to 20 years under its policies. This information though will be in an anonymized format.

#### Security and Privacy Considerations

The CNE is implementing information and data management protocols to ensure that personal and confidential information are properly collected, managed and stored. Given the feedback from the Office of the Privacy Commissioner, the CNE will require partners to enter into agreements that provide for the protection of personal and non-personal confidential information.

#### **Adherence to Fair Information Principles**

##### Governance

The CNE is committed to ensuring that personal and confidential information collected under its NZE program is treated in compliance with the Personal Information Protection and Electronic Documents Act. The CNE is implementing an Integrated Management System auditable to ISO Standards; 9001:2015 Quality Management; 20000-1:2011 Information Technology Service Management; and 27001:2013 Information Security Management.

It is also noteworthy that developing a privacy and data protection policy is a priority of the CNE. Recognizing the vast amounts of personal, employee, business and confidential information it handles regularly, the CNE plans to ensure that information is properly classified. Classification of the information it collects, uses and processes will ensure that, through policies, the CNE can establish the appropriate protection of that information and define access and disclosure restrictions.

##### Ownership and Control

Personal information required under its housing program will be owned and controlled by the CNE. In fact, where third party services are required to process the information, the CNE standard contracts contain clauses ensuring that any information obtained or

processed by the third party remains the property of the CNE. More importantly, the information cannot be accessed directly by the third party on the CNE information system without first obtaining the necessary authorizations. The authorization is given in the form of a letter that must set out the purpose of the access and the period of access.

In the NZE program, the CNE will also retain ownership and control of the data generated by the sensors and data loggers installed in NZE homes for monitoring purposes.

#### Consent

The CNE collects and holds information relating to members under other programs, including member benefits and elections. However, there is no information sharing between departments and programs unless the member expressly consents to disclosure of this information.

The name and address of occupants as well as information relating to membership are generally publicly known given the size of Eastmain. While the CNE may have a general understanding of certain health conditions, this information must be obtained directly from the individual or, if incapable, from that individual's caregiver with express consent.

Under the NZE program, CNE will only collect information from occupants of NZE houses or NZE retrofits, as required by the regional and CNE housing policies. This involves collecting personally-identifying information and information relating to occupants' financial situation directly from occupants. Prior to collecting this information, the CNE will ask occupants to consent to the collection of their personal information, using a consent form developed for the Housing Department needs. Pursuant to CNE practices, occupants must also consent specifically to the further sharing of information.

Occupants of NZE houses and NZE retrofits will also be asked to consent, on a voluntary basis, to the collection of information generated by the sensors and data loggers installed in the NZE houses and retrofits and will be told the purpose of such collection. Consent must be given in writing and will be related solely to the research conducted by Concordia University. The information will include addresses and other personally-identifying information collected by the CNE.

Concordia University will also request the consent of occupants participating in the NZE program monitoring. The consent form will explain in plain language that consent is given on a voluntary basis, with the option to withdraw at any time.

McGill University will collect information through one-on-one interviews, surveys and questionnaires. Occupants of NZE houses will be given a questionnaire each year. All collection and use of the data obtained through these methodologies will be subject to the consent of the occupant and McGill University must pass all research by the Ethics Committee to ensure that it conforms to McGill University's policy on protection and retention of personal information<sup>10</sup>.

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<sup>10</sup> *Ibid.*

### Data Minimization and De-identification

Information relating to energy use and production is non-personal information generated by the sensors and data loggers installed in NZE homes and retrofits and will be collected by the CNE Housing Department. The information will include the addresses of the homes, but this information will be removed before transmission of the non-personal energy use information. The CNE will anonymize all information before it is transmitted to Concordia University for the purposes of its study.

### Access

Because personal information is collected for the purposes of administering the NZE housing program, it is important that it be accurate and up-to-date. Under CNE policies personal financial information must be updated every two years to ensure its accuracy. Individuals may also periodically update or modify their information by making a request to the Housing Department.

Under the Constitution of the Cree Nation of Eeyou Istchee, the CNE must set up a process to respond to access to information requests. This will include identifying the person who will respond to such requests. Presently, members attend the CNE administration offices to request access to information and documents held by the CNE.

Individuals may access information pertaining to them to ensure its accuracy and make corrections. Generally, this is done directly with the department holding the information.

### Security

The information held by the Housing Department is kept in locked cabinets and password-protected computers to ensure information is adequately protected and can only be accessed by those administering the housing programs.

The CNE is sensitive to the need to protect the privacy of residents. By classifying information and setting access rights accordingly, it will restrict access to personal information it receives from occupants under its housing programs.

All information collected by McGill University will be anonymized. The names of study participants will be kept in separate password-protected files. Each participant will be attributed a number to prevent their identification. McGill University is alive to the risk that some participants will be readily identifiable solely on the basis of their comments or responses and will look for ways to mitigate. All information is kept in a password-protected computer in a research lab that can only be accessed with a code.

The NZE houses will be equipped with connective technology allowing Concordia University to monitor and measure field data and performance data. The data generated through the monitoring equipment will be sent by the CNE to Concordia University using Secure Socket Layer (SSL). This will ensure an encrypted link is maintained between the web server and browser and prevent cybersecurity breaches that would put the data at risk of unauthorized access or unintentional disclosure.

## Open Data Strategies

The CNE has embraced an open, transparent data strategy aimed at ensuring ongoing communications with Eastmain residents on the NZE program. The level of consultation and community engagement has been extremely high and will continue under the NZE program.

Open data strategies will ensure that Eastmain residents have access to the results of the studies being conducted by Concordia University and McGill University.

Through smart technologies installed in NZE houses, occupants will have access to information relating to their energy use and production, energy use patterns and indoor air quality of their houses. These technologies are commercially available which means that they are easily transferable and reproducible in other projects and communities.

## Risks

Table 21 – Risk Analysis

Risks	Preventive Measures	Corrective Measures
Accidental/intentional disclosure of personal information	Keep hard copy information in a secure, locked location Password protect computers and computer files	Inform occupants of breach Impose secure storage and password protection protocols
Identification of occupant from responses to McGill questionnaire	Phrase responses to avoid identification Explain to respondents the risk of identification	Remove response from published study
Accidental/intentional disclosure of health information	Keep hard copy information in a secure, locked location Password protect computers and computer files	Inform occupants of breach Impose secure storage and password protection protocols
Accidental/intentional disclosure of financial information	Keep hard copy information in a secure, locked location Password protect computers and computer files	Inform occupants of breach Impose secure storage and password protection protocols
Decision-making based on out-dated or inaccurate information	Ensure information is updated regularly Ask occupants to provide updated information	Correct information

## CHAPTER 8: FINANCIALS

The CNE has extensive experience in managing capital projects, from securing funding and managing costs, to completion of various multi-million-dollar projects undertaken over the last ten years. Projects included construction of public facilities, infrastructure and housing. CNE benefits from some of the most up-to-date technologies to manage its projects including GIS, Accounting and Cost Control Systems, Preventive Maintenance, Project Management and Document Management Systems, that are linked together to improve efficiency. Our IT systems will soon be updated to a hyper-converged infrastructure that permits multiple servers to act as one which improves scalability, data protection, management, maintenance and operational activities.



As a Cree local government, the CNE is required to follow the Canadian public sector accounting standards prescribed for governments as recommended by the Public Sector Accounting Board of the CPA Canada with exceptions of certain requirements as agreed by Canada and as detailed in our annual Independent Auditors Report. CNE management is responsible for the integrity and objectivity of financial statements and for implementing and maintaining a system of internal controls to provide reasonable assurance that reliable financial information is produced. CNE's Council is responsible for ensuring that management fulfills its responsibilities for financial reporting and internal controls and is ultimately responsible for reviewing and approving the financial statements.

Local companies in Eastmain, working with external skilled tradespeople for plumbing, electrical, heating and ventilation, will be constructing and retrofitting the NZE units. The CNE will be responsible for securing all funding and issuing contracts to Stajune Construction for project management and cost control of the construction works on a fixed-cost basis throughout the program. The CNE will also be responsible for monitoring the overall NZE program, risk management, the purchasing and negotiating with suppliers for all construction materials and the control of inventory.

### **Project Budget**

Funding for the CNE NZE program has been secured, with the exception of the Smart City Challenge winner's prize, and revenues generated from the sale and leasing of housing units. The CNE will continue to apply under any funding programs that can benefit the NZE program.

#### Revenues

Details of our secured and projected revenue sources are as follows

- **Cree Nation of Eastmain**  
The CNE will contribute up to \$5M from its Local Economic Development Fund over a six-year period for the NZE program activities, matching the SSC prize if CNE is chosen as the winner
- **Infrastructure Fund**  
Funding comes from an annual subsidy provided to the CNE through the regional government for housing and infrastructure purposes
- **Housing Action Plan**  
These funds are received from the regional government for urgent mould remediation and housing renovations
- **Regular Program Subsidies**  
Grants from the regional government help off-set the high costs of construction in Eeyou Istchee
- **Smart City Challenge**  
The prize awarded to the winner of the Smart Cities Challenge \$5M category

- **Sales and Rent**

The monies received from the sales of the NZE private homeownership houses and the monthly rent collected from tenants occupying rental housing units

- **Training and Development**

Revenues secured by the CNE to date from outside sources that have programs designed to build capacity in Indigenous communities

### Expenses

Expenses for our NZE program are costed in today's dollars and exclude possible year-to-year inflationary increases that would normally apply to construction labour and materials. The CNE believes that as it gains experience in net-zero building techniques, efficiencies will off-set annual inflation numbers. Also, costing for material was based on northern norms and excludes potential savings that may be generated by bulk ordering materials and establishing and improving CNE's supplier management processes and the relationships within the supply chain.

CNE NZE program projected expenses are

- **Accessible Housing Unit**

Construction costs for building an Accessible House pilot unit in year-1 of the NZE program

- **Multi-Client Six Plex**

Construction costs for building 5 Six-Plex buildings over a five-year period between year-2 and year-6 of the program

- **Detached Single Family Unit**

Construction costs for building 4 single-family houses in year-2 through year-5 of the NZE program (this excludes the pilot Accessible House). Year-2 and year-4 will see a 2-bedroom Starter House built and a 3-bedroom Private Homeownership House will be built in year-3 and an Elders House built in year 5

- **NZE Retrofit**

Expenses are related to carrying out a net-zero retrofit pilot in year-1 and retrofitting 4 units in year-2, and 5 retrofits each year for years 3 to 6

- **Training and Development**

These expenses represent the estimated costs for training and work experience programs for construction workers in relation to net-zero building and potential CNE contributions to qualify community members in the skilled trades of plumbing, electrical, heating and ventilation

- **Program Administration**

These expenses are related to CNE project oversight and personnel required to ensure overall success through continuous program marketing, operational support by technical experts, professionals and applying for additional resources to extend projects beyond the Smart Cities Challenge

- **Solar Technologies**

The Cost "B" estimate for the Accessible House, based on the energy modeling exercise used to determine the size of the photovoltaic array needed to produce

the electricity requirements to reach net-zero status. This number was used to determine the average number of photovoltaic panels per unit being built and retrofitted per year.

SMART CITY CHALLENGE----Net Zero Energy Housing Program							
Proforma Financial Statements							
	Year Ended 31-Mar-20 Proforma \$	Year Ended 31-Mar-21 Proforma \$	Year Ended 31-Mar-22 Proforma \$	Year Ended 31-Mar-23 Proforma \$	Year Ended 31-Mar-24 Proforma \$	Year Ended 31-Mar-25 Proforma \$	Totals \$
<b>Revenue:</b>							
Cree Nation of Eastmain	100,000	900,000	1,000,000	1,000,000	1,000,000	1,000,000	5,000,000
Infrastructure Fund	147,912	20,112	20,112	20,112	20,112	20,112	248,472
Housing Action Plan	196,790	196,790	196,790	196,790	196,790	196,790	1,180,740
Regular Program Subsidies	127,800	633,200	674,600	633,200	544,800	544,800	3,158,400
SMART Cities Challenge winner's prize	517,285	1,160,551	1,225,331	1,063,633	1,033,200	-	5,000,000
Sales and Rent	3,000	871,956	871,956	871,956	871,956	598,876	4,089,700
Training and Development Fund	27,563	13,782	-	-	-	-	41,345
<b>Total Revenue</b>	<b>1,120,350</b>	<b>3,796,391</b>	<b>3,988,789</b>	<b>3,785,691</b>	<b>3,666,858</b>	<b>2,360,578</b>	<b>18,718,657</b>
<b>Expenses:</b>							
Accessible Housing Unit	276,743	-	-	-	-	-	276,743
Multi-Client Six Plex	-	1,823,308	1,823,308	1,823,308	1,823,308	1,823,308	9,116,540
Detached Single Family Unit	-	320,446	348,419	320,446	312,959	-	1,302,270
NZE Retrofit	177,565	710,260	887,825	887,825	887,825	887,825	4,439,125
Training & Development	50,000	35,000	25,000	15,000	-	-	125,000
Program Administration	325,550	325,550	325,550	325,550	325,550	325,550	1,953,300
Solar Technologies	50,000	275,000	300,000	300,000	300,000	275,000	1,500,000
<b>Total Expenses</b>	<b>879,858</b>	<b>3,489,564</b>	<b>3,710,102</b>	<b>3,672,129</b>	<b>3,649,642</b>	<b>3,311,683</b>	<b>18,712,978</b>
EXCESS (DEFICIENCY) OF REVENUE OVER EXPENSES	240,492	306,827	278,687	113,562	17,216	951,105	5,679
FUND BALANCE-BEGINNING OF YEAR	-	240,492	547,319	826,006	939,568	956,784	-
<b>FUND BALANCE-END OF YEAR</b>	<b>240,492</b>	<b>547,319</b>	<b>826,006</b>	<b>939,568</b>	<b>956,784</b>	<b>5,679</b>	<b>5,679</b>

Figure 7. Proforma Financial Statements

The proforma financial statements does not reflect the bulk ordering of all construction material (excluding electrical, plumbing, heating and ventilation) which will be purchased by Stajune Construction in the Fall of year-1, for construction projects to be carried on in year 2 and every subsequent year.

Figure 8. Quarterly Expenses per Year.

CASH OUT SPLIT BY QUARTER AND YEAR							
Year/Quarter	Q1	Q2	Q3	Q4	Total expenses per year	Other Expenses maintenance:	Total Cash Out per year
<b>2020</b>			\$ 617,075.00	\$ 262,783.00	\$ 879,858.00		\$ 879,858.00
<b>2021</b>	\$ 537,214.50	\$ 537,214.50	\$ 1,247,790.50	\$ 1,167,344.50	\$ 3,489,564.00		\$ 3,489,564.00
<b>2022</b>	\$ 537,214.50	\$ 537,214.50	\$ 1,354,546.00	\$ 1,281,127.00	\$ 3,710,102.00		\$ 3,710,102.00
<b>2023</b>	\$ 537,214.50	\$ 537,214.50	\$ 1,316,573.00	\$ 1,281,127.00	\$ 3,672,129.00		\$ 3,672,129.00
<b>2024</b>	\$ 537,214.50	\$ 537,214.50	\$ 1,294,086.00	\$ 1,281,127.00	\$ 3,649,642.00		\$ 3,649,642.00
<b>2025</b>	\$ 537,214.50	\$ 537,214.50	\$ 981,127.00	\$ 1,256,127.00	\$ 3,311,683.00		\$ 3,311,683.00

### Class B Methods and Assumptions

As the CNE NZE program is primarily comprised of capital projects relating to construction, the below Figure 9 was used as the basis for construction Class "A" through "D" estimates.

Figure 9. Construction Class Estimates

Class of estimate	Design Estimate Effort	Project Contingency Range (%)		Cost estimate basis	
		(-)	(+)	Materials	Labor
A	Finalized (100% complete tender documents)	5%	10%	As for Class B, with material on approx. 100% firm basis	As for Class B, some actual field labor productivity may be available
B	Detailed (66% Design development)	10%	15%	Firm unit cost quotes based on detailed quantity take-off	Estimated man-hour units (including assessment) using expected labor rate for each job classification
C	Preliminary (33% Design development)	15%	20%	Labor/material ratios for similar work, adjusted for site conditions and using expected labor rates	
D	Concept (simplified)	20%	30%	By overall project or by ratio to area or global project unit and comparison with similar work with materials adjusted to current cost indices and labor adjusted to site conditions.	

Estimates were realized by an Indigenous engineering firm involved in Indigenous construction projects and are specialised in construction project management. These estimates were based on completed preliminary design drawings, including definition of major systems and subsystems and outline specifications. These documents were prepared by an Architectural Technician under supervision of the Designer and a net-zero builder. The estimates include documented work breakdown and quantities calculations. Rough material prices used for the estimates were provided by a regional supplier. Mechanical equipment and other material prices were based on budget bids obtained from various suppliers. Realistic assumptions were made on labour productivity. Labour rates were based on rates established by the Commission de la construction du Québec and the estimated ratios of local and external tradespeople. Finally, estimates were cross-checked by using a unit price method based on similar project experiences.

#### Contributions from other Sources

The CNE NZE program will leverage revenues generated as set out above, other contributions and the Smart Cities prize money to amplify the impact and reach of our program by

- applying for additional provincial and federal funding geared toward enhancing accessibility for persons with disabilities
- obtaining in-kind contributions and/or financial assistance from our partners and government programs including
  - ❖ the Concordia University Centre for Net-Zero Energy Building Studies in-kind and financial contributions through funding received from (NSERC) that supports its net zero research projects and initiatives

- ❖ McGill University research carried out under a research grant funded by CMHC under its Research Planning Fund (RPF) (See Annex – Letter of Approval)
- ❖ Cree Human Resources Development is subsidizing the salaries of three local youth to assist CNE with project coordination and proposal development
- ❖ CMHC is contributing funding under a youth work experience program in relation to research and team environment initiatives via a grant through the Housing Internship Initiative for First Nation and Inuit Youth program (HIIFNIY )(See Annex\*)

The CNE's project management team will continually apply to funding programs and other revenue sources to leverage success. This includes any local, regional and national programs that support Indigenous and accessible housing, green technologies, capacity building, smart technologies and research that captures net-zero development and the human experience related to our project to ensure sustainability beyond the Smart Cities Challenge.

With that said, this Smart Cities Challenge has already yielded success for the CNE. The CNE approached housing holistically from a 360-perspective for the comprehensive engagement of all stakeholders including community members, academia, industry experts and the supply chain. By undertaking this approach with a more fulsome consultation of the supply chain and industry stakeholders, the CNE was able find significant savings compared to the way business was normally done. In fact, detailed costing of the CNE prototypes was initially estimated at \$3M for the Six-Plex however the Class B estimates for the Six-Plex came in under \$2M resulting in greater affordability per unit. This cost savings also applies to all other new units built under our program.

#### Financial Tools and Methodologies

Fund accounting is the financial methodology used by the CNE that results in a self-balancing set of accounts for each fund established by legal, contractual or voluntary actions. Transactions are accounted for under five different funds established by laws. The accounting software, Sage 300, as well as Committed Cost systems are used for the financial operations. Those systems enable the CNE to account for expenses by department at the General Ledger level. The departments represent projects for the Special Projects Fund, the same applies to the General Operation Fund and the Capital Additions Fund.

Committed Cost systems enable the issuance of purchase orders related to specific projects taking into consideration the available budget per account and fiscal period. This information is transferred into Sage 300 in order to provide reporting per project including actual costs, budgets as well as commitments. The financial plan for our NZE program is based on budgeted cash flows on an accrual basis.

Project management implementation will use MS Project along with the principles outlined by the Project Management Institute (PMI) for project management and with cost

accounting methodologies managed through Sage 300. The CNE will further ensure proper project management by implementing all aspects of our ISO/IMS.

### Risk Identification and Mitigation

Below are the risks identified by the CNE with respect to the financial operations of its NZE program.

Table 22 - Risk Analysis

Risks	Preventive Measures	Corrective Measures
Cost overruns	<ul style="list-style-type: none"> <li>Implement contractor/supplier management best practices</li> <li>Hire an experienced construction project manager and site supervisor</li> <li>Conduct audit on all construction and project management processes</li> </ul>	<ul style="list-style-type: none"> <li>Adjust project scope and budgets</li> <li>Identify root cause and implement audit findings to improve efficiency</li> </ul>
Unable to sell units as individuals can't qualify for a mortgage	Pre-screen and pre-qualify parties	<ul style="list-style-type: none"> <li>Identify additional purchasers</li> <li>Re-classify a 'for sale' unit as a conditional rent to own until the potential purchaser can qualify for a mortgage</li> </ul>
Construction company unable to secure necessary resources for construction	Assist companies in securing capital funds on a project by project basis	<ul style="list-style-type: none"> <li>Foster partnerships and joint ventures between companies to improve their financial capacity</li> <li>Directly manage the project through Eastmain's development corporation</li> <li>Increase CNE's investment into the project</li> </ul>
Cost of constructing net zero homes is too expensive in Eastmain	<ul style="list-style-type: none"> <li>Scale project to "net-zero ready" energy performance</li> <li>Identify and secure federal and/or provincial green energy subsidies to offset the cost of the alternative energy systems (e.g. solar)</li> <li>Redesign units to accommodate a smaller living space</li> </ul>	<ul style="list-style-type: none"> <li>CNE develops an in-house green energy subsidy program</li> <li>Re-evaluate and redesign the construction system</li> <li>Build smaller units</li> <li>Enter into agreements with companies that result in lower profit margins in exchange for project guarantees</li> </ul>
Insufficient rent collection on rental units to help support operation and maintenance and reinvestment into future construction	<ul style="list-style-type: none"> <li>Pre-qualifying renters by verifying their credit history</li> <li>Request rental deposits</li> <li>Verify capacity to pay</li> <li>Credit bureau reporting</li> <li>Ensure rental agreements are fair and drafted to look after the best interests of both parties while protecting the investment of the property owner</li> </ul>	<ul style="list-style-type: none"> <li>Terminate occupant's rental agreement as a result of failing to pay and evict the tenant</li> <li>Amend rental agreement to require a co-signer whom would also be liable for any rental arrears</li> <li>Institute penalties through forfeiture of local subsidies and automatically apply grant to rental arrears</li> <li>Suspend eligibility for local grants, loans and subsidies to persons with rental arrears</li> <li>Take legal action</li> </ul>
Negotiations with the supply chain are not successful in reducing the current cost of materials	<ul style="list-style-type: none"> <li>Pre-discussions with suppliers with regards to what we are trying to achieve with the SCC to foster win-win relationships</li> <li>Expand the list of suppliers that are approached</li> </ul>	Re-tender the ordering of materials

### Finalist Grant Report

The CNE supplemented the finalist grant with funds from its operations and partners to help offset the costs associated with project coordination, proposal development and the activities needed to design and build its systems and costing. The finalist grant funding was used along with CNE funds to develop the final proposal. Detailed use of those resources are as follows:

- **Project Coordination**

Expenses for the assignment and reassignment of CNE personnel to coordinate all project activities through the project management team

- **Stakeholder Engagement**

Sessions were regularly held throughout the project development phase to acquire technical information and clarify expectations and roles of all stakeholders while obtaining feedback from the community members and all other interested parties

- **Proposal Development**

Costs related to CNE staff time as well as the effort put forth in organizing information and assistance by partners to draft the final proposal

- **Building Designs and Systems expenditures** (architecture, energy modelling, engineering)

Refining the designs of each of the housing prototypes that were developed based on extensive consultation with community members and resulted from energy modelling exercises and consultation with net-zero and local builders and the housing materials and equipment supply chain

- **Data Modelling**

These costs were for the data modelling exercises required to determine the building system and technologies required to meet net-zero targets as part of the design process

- **Plans, Specs and Costing**

These were incurred in developing the working drawings, design of the HVAC system and solar systems, analysis and selection of accessible housing equipment, and selection of the household lighting and other equipment

- **Jury Meetings**

The costs for travel, lodging and per diem relating to meeting with the SCC Jury in Toronto to represent CNE's project and answer questions posed by the Jury.

Our project had a minor deviation regarding the original application. We decided to extend the project from five years to six years in order that year-1 could serve as a pilot year to ensure detailed costing is obtained through extensive project oversight and to identify true costs versus billed costs. The pilot year will be used to account for actual costs of material and labour to ensure data is available to properly analyse actual costs within the environment. This information will give policy makers data that reflects the northern reality thus enabling them to make informed decisions.

Figure 10. Finalist Grant Financial Report

SMART CITIES CHALLENGE FINALIST GRANT						
<b>Project Revenues:</b>						
Smart Cities Challenge Finalist Grant	\$	250,000				
Cree Nation of Eastmain		73,344				
CMHC-HIIFNIY Fund		36,000				
CHRD		27,563				
<b>Total Revenues</b>	<b>\$</b>	<b>386,907</b>				
<b>Project Expenses:</b>						
<b>Fiscal Year</b>	<b>2018 - 2019</b>				<b>Total</b>	
<b>Financial periods</b>	<b>Qrt 1</b>	<b>Qrt 2</b>	<b>Qrt 3</b>	<b>Qrt 4</b>		
Project Coordination	\$ 1,500	\$ 7,807	\$ 12,194	\$ 43,192	\$	64,693
Stakeholder Engagement Sessions:						
Community Members		11,666	4,050			15,716
Partners		1,757	12,759	1,500		16,015
Contractors and Suppliers			17,966	12,600		30,566
Proposal Development	18,807	8,100	15,136	107,392		149,435
Building Designs and Systems	13,376	3,450	31,831	16,100		64,757
Data Modeling			-	6,609		6,609
Plans, Specs and Costing			6,500	18,820		25,320
Jury Meetings			13,796			13,796
<b>Total Quarterly Expenses</b>	<b>\$ 33,683</b>	<b>\$ 32,780</b>	<b>\$ 114,231</b>	<b>\$ 206,213</b>	<b>\$</b>	<b>386,907</b>

### Other Details

Class B estimates were established for the pilot construction of the Accessible House (first single-family house) and for the Six-Plex. A Class "B" estimate for the Six-Plex was derived from the detailed section, plans and elevations of the Six-Plex, and the costing for construction details and mechanical systems of the Accessible House (as these are the same construction details that will be used in all the NZE houses). For all other aspects of our project, Class "D" estimates will be used until building systems have been finalized and lessons learned from the pilot projects are applied. Plans and specs for Class "A" estimates for the tendering of the Accessible House will require identifying the specific exterior and interior finishing materials (flooring, lighting, etc.) and household equipment for the house.



Table 23 – Detailed Costing of NZE Program

Detailed Cost (accessible house)				
	Unit Price	Quantity	TOTAL COST	
FIXED ASSETS	Accessible Housing Unit	\$232.52	1,190	\$ 276,700.00
	NZE Retrofit	NA	NA	\$ 177,600.00
	Multi-Client Six Plex	\$222.76	8,185	\$ 1,823,300.00
	Single Family Unit	\$ 219.15	1,463	\$ 320,500.00
	NZE Retrofit	NA	NA	\$ 710,300.00
	Multi-Client Six Plex	\$ 222.76	8,185	\$ 1,823,300.00
	Single Family Unit	\$238.22	1,463	\$ 348,400.00
	NZE Retrofit	NA	NA	\$ 887,800.00
	Multi-Client Six Plex	\$ 22.76	8,185	\$ 1,823,300.00
	Single Family Unit	\$ 294.04	1,090	\$ 320,500.00
	NZE Retrofit	NA	NA	\$ 887,800.00
	Multi-Client Six Plex	\$ 222.76	8,185	\$ 1,823,300.00
	Single Family Unit	\$ 231.85	1,350	\$ 313,000.00
	NZE Retrofit	NA	NA	\$ 887,800.00
	Multi-Client Six Plex	\$ 222.76	8,185	\$ 1,823,300.00
	NZE Retrofit	NA	NA	\$ 887,800.00
	Training & Development	NA	NA	\$ 125,000.00
	Program Administration	NA	NA	\$ 1,953,300.00
	Solar Technologies	NA	NA	\$ 1,500,000.00
TOTAL				\$ 18,713,000.00

Note: The values are rounded.

## Class B Estimates for CNE NZE Program

Figure 11. Accessible House

Project: Accessible House Date: March 4th 2019  
 Project Nu: 028-19011 Revision 3  
 Prepared by: Jean Larouche  
 Type: New building  
 Location: Eastmain

**Ashini CONSULTANTS**

ID	Qty	Description	Unit	PU	Material	Labor	Man-hours	Sub-total	Contingency Class B		Notes
									-10%	15%	
1	1	Water input	gf	4 850,00 \$	3 335,00 \$	1 455,00 \$	21	4 850,00 \$	4 365,00 \$	5 577,50 \$	
2	430	Excavation/embankment	m3	21,50 \$	9 241,50 \$	4 063,50 \$	38	13 545,00 \$	12 190,50 \$	15 576,75 \$	Mat included excavation equipment
3	7,5	Foundations	m3	- \$	10 686,53 \$	15 000,00 \$	214	25 686,53 \$	23 117,88 \$	29 539,51 \$	Concrete : 300\$/m3, mat includes pump
3.1	6	Main footing	m3	- \$	- \$	- \$	-	- \$	- \$	- \$	
3.2	1,5	Isolated footing	m3	1 081,50 \$	- \$	- \$	-	- \$	- \$	- \$	
3.3	7,25	Isolated foundation walls	m2	32,73 \$	- \$	- \$	-	- \$	- \$	- \$	
4	1240	Building exterior walls	m2	- \$	- \$	- \$	-	- \$	- \$	- \$	
4.1	1240	Structure and insulation	m2	11,28 \$	6 708,40 \$	5 015,80 \$	73	11 724,20 \$	10 551,78 \$	13 482,43 \$	
4.2	1300	Insulation	m2	- \$	2 256,80 \$	- \$	-	2 256,80 \$	2 031,12 \$	2 596,12 \$	
4.3	1	Outside siding (Cemex)	m2	8,25 \$	4 134,00 \$	6 591,00 \$	94	10 725,00 \$	9 652,50 \$	12 333,75 \$	
5	1200	Doors and windows (triple verres)	gf	12 725,00 \$	12 926,38 \$	5 239,00 \$	79	18 490,38 \$	16 639,63 \$	21 236,19 \$	1 bid
5.1	1200	Main floor	m2	7,54 \$	4 272,00 \$	3 000,00 \$	43	7 272,00 \$	6 544,00 \$	8 361,80 \$	
5.2	1200	Structure	m2	- \$	- \$	- \$	-	- \$	- \$	- \$	
5.2	1200	Flooring	m2	7,45 \$	4 023,00 \$	4 917,00 \$	70	8 940,00 \$	8 046,00 \$	10 381,00 \$	Includes ceramic and vinyl (no price from rona for material)
6	2100	Roof	m2	- \$	- \$	- \$	-	- \$	- \$	- \$	
6.1	2100	Structure and insulation	m2	11,43 \$	10 790,00 \$	14 042,50 \$	201	24 832,50 \$	22 340,25 \$	28 587,38 \$	includes lifting equipment
6.2	2100	Insulation	m2	- \$	1 781,00 \$	- \$	-	1 781,00 \$	1 602,90 \$	2 044,10 \$	
6.2	2100	Roofing	m2	3,91 \$	1 783,00 \$	3 200,00 \$	46	4 983,00 \$	4 486,50 \$	5 732,75 \$	local labor
6.3	2100	Flashing	m2	2,15 \$	1 533,00 \$	2 971,50 \$	42	4 504,50 \$	4 054,05 \$	5 180,18 \$	
7	1200	Concrete slab	m2	- \$	- \$	- \$	-	- \$	- \$	- \$	
7.1	1200	Insulation	m2	6,53 \$	2 796,00 \$	1 500,00 \$	22	4 296,00 \$	3 866,40 \$	4 940,40 \$	
7.2	1200	Concrete and finish	m2	7,98 \$	3 330,00 \$	4 000,00 \$	57	7 330,00 \$	6 601,50 \$	8 435,25 \$	Mat price includes pump
8	155	Interior walls	sq	- \$	- \$	- \$	-	- \$	- \$	- \$	
8.1	155	Flaming	sq	42,16 \$	2 464,50 \$	4 099,75 \$	59	6 564,25 \$	5 907,83 \$	7 546,89 \$	
8.2	18	Interior doors	unit	533,50 \$	2 157,00 \$	2 869,00 \$	41	5 255,00 \$	4 782,50 \$	6 098,75 \$	
8.3	3200	Drywall	m2	2,37 \$	1 688,00 \$	5 680,00 \$	81	7 368,00 \$	6 611,20 \$	8 703,20 \$	
8.4	5000	Plastering	m2	1,00 \$	1 150,00 \$	3 450,00 \$	49	4 600,00 \$	4 140,00 \$	5 290,00 \$	
8.5	5000	Painting	m2	1,80 \$	2 484,00 \$	5 796,00 \$	83	8 280,00 \$	7 452,00 \$	9 522,00 \$	


Project: Accessible House Date: March 4th 2019  
 Project Nu: 028-19011 Revision 3  
 Prepared by: Jean Larouche  
 Type: New building  
 Location: Eastmain


**Ashini CONSULTANTS**

ID	Qty	Description	Unit	PU	Material	Labor	Man-hours	Sub-total	Contingency Class B		Notes
									-10%	15%	
9	1	Plumbing	gf	- \$	- \$	- \$	-	- \$	- \$	- \$	
9.1	1	Water input	gf	3 250,00 \$	1 385,38 \$	1 698,13 \$	24	3 087,50 \$	2 778,75 \$	3 550,63 \$	
9.2	1	Distribution	gf	13 868,37 \$	5 928,79 \$	7 246,22 \$	104	13 174,95 \$	11 857,46 \$	15 151,19 \$	
9.3	1	Accessories	gf	10 257,64 \$	7 308,14 \$	2 436,26 \$	35	9 744,19 \$	8 769,77 \$	11 385,82 \$	
10	1	Electricity	gf	- \$	- \$	- \$	-	- \$	- \$	- \$	
10.1	1	Electric input	gf	4 650,00 \$	2 871,38 \$	1 546,13 \$	22	4 417,50 \$	3 975,75 \$	5 080,13 \$	
10.2	1	Distribution	gf	13 150,00 \$	5 821,63 \$	6 870,88 \$	98	12 492,50 \$	11 243,25 \$	14 366,38 \$	
10.3	1	Lighting/accessories/fixtures	gf	2 500,00 \$	1 781,25 \$	593,75 \$	8	2 475,00 \$	2 137,50 \$	2 771,25 \$	
11	1	Ventilation	gf	- \$	- \$	- \$	-	- \$	- \$	- \$	Bid for HVAC equipment
11.1	1	HVAC unit	gf	11 175,00 \$	8 224,80 \$	2 066,20 \$	29	10 281,00 \$	9 252,90 \$	11 823,15 \$	
11.2	1	Distribution	gf	8 257,04 \$	3 798,24 \$	3 798,24 \$	54	7 596,48 \$	6 836,83 \$	8 735,95 \$	
11.2	1	Grid and accessories	gf	2 450,00 \$	1 127,00 \$	1 127,00 \$	16	2 254,00 \$	2 028,60 \$	2 592,10 \$	
12	1	Cabinet making	gf	15 200,00 \$	13 844,16 \$	1 538,24 \$	21,97	15 382,40 \$	13 844,16 \$	17 689,76 \$	
13	1	Electricity (Hydro-Quebec)	gf	- \$	- \$	- \$	-	- \$	- \$	- \$	
14	1	Wood stove	gf	12 500,00 \$	11 250,00 \$	1 250,00 \$	17,86	12 500,00 \$	11 250,00 \$	14 375,00 \$	Bid for equipment
		Material from Rona:		56 787,23 \$							
		<b>Total:</b>		<b>153 391,80 \$</b>	<b>123 350,75 \$</b>	<b>123 350,75 \$</b>	<b>1 762</b>	<b>276 742,55 \$</b>	<b>249 068,29 \$</b>	<b>318 253,93 \$</b>	
		<b>Building area:</b>	<b>1190 m2</b>								
		<b>Cost by m2:</b>						<b>232,56 \$</b>	<b>209,30 \$</b>	<b>267,44 \$</b>	

**Assumptions**  
 Materials costs by Rona from edmonton contractor estimate (transport to Eastmain included) for a total of 56 787,23\$  
 Labor: 60% of the workers are locals (50\$/h) and 40% of the workers are externals (100\$/h including lodging, catering and transport)  
 1760MH: 10 weeks-4 workers-40h/sem  
 No project management included

Figure 12. Six-Plex

		Project:	Six Plex	Date:	March 4th 2019							
		Project Nu :	028-19011	Revision	0							
		Prepared by :	Jean Larouche									
		Type :	New building									
		Location :	Eastmain									
										Contingency Class B		
ID	Qty	Description	unit	PU	Material	Labor	Man-hours	Sub-total	-10%	15%	Notes	
1	6	Water input	gl	2 750,00 \$	11 550,00 \$	4 950,00 \$	71	16 500,00 \$	14 850,00 \$	18 975,00 \$		
2	1125	Excavation/ embankment	m3	31,50 \$	24 806,25 \$	10 611,25 \$	152	35 437,50 \$	31 893,75 \$	40 753,13 \$	Mat included excavation equipment	
3	24	Foundations	m3		34 196,90 \$	51 471,85 \$	735	85 668,75 \$	77 101,88 \$	98 519,06 \$	Concrete : 3005/m3, mat includes pump	
3.1	18	Main footing	m3	1 325,00 \$	- \$	- \$	-	- \$	- \$	- \$		
3.2	6	Isolated footing	m3	1 050,00 \$	- \$	- \$	-	- \$	- \$	- \$		
3.3	1645	Isolated foundation walls	sq2	33,75 \$	- \$	- \$	-	- \$	- \$	- \$		
4	7345	Building exterior walls	sq2									
4.1	7345	Structure	sq2	7,25 \$	39 736,45 \$	13 514,80 \$	193	53 251,25 \$	47 926,13 \$	61 238,94 \$		
4.2	7345	Insulation	sq2	4,20 \$	13 367,90 \$	17 481,10 \$	250	30 849,00 \$	27 764,10 \$	35 476,35 \$		
4.3	6230	Outdoor siding (Canexel)	sq2	13,50 \$	19 811,40 \$	64 293,60 \$	918	84 105,00 \$	75 694,50 \$	96 720,75 \$		
4.4	1	Doors and windows (triple glasses)	gl	98 980,00 \$	79 184,00 \$	19 796,00 \$	283	98 980,00 \$	89 082,00 \$	113 827,00 \$	1 bid for windows	
5	5890	Main floor	sq2									
5.1	5890	Structure	sq2	8,50 \$	20 968,40 \$	29 096,60 \$	416	50 065,00 \$	45 058,50 \$	57 574,75 \$		
5.2	5890	Flooring	sq2	7,50 \$	19 878,75 \$	24 296,25 \$	347	44 175,00 \$	39 757,50 \$	50 801,25 \$	Includes ceramic and vinyl (no price from rona for material)	
6	4165	Second floor	sq2									
6.1	4165	Structure	sq2	7,00 \$	14 827,40 \$	14 327,60 \$	205	29 155,00 \$	26 239,50 \$	33 528,25 \$		
6.2	4165	Flooring	sq2	7,50 \$	14 056,88 \$	17 180,63 \$	245	31 237,50 \$	28 113,75 \$	35 923,13 \$	Includes ceramic and vinyl (no price from rona for material)	
7	15757	Roof	sq2									
7.1	15757	Structure	sq2	12,75 \$	67 597,53 \$	133 304,22 \$	1904	200 901,75 \$	180 811,58 \$	231 037,01 \$	Includes lifting equipment	
7.2	6100	Insulation	sq2	4,50 \$	17 995,00 \$	9 455,00 \$	135	27 450,00 \$	24 705,00 \$	31 567,50 \$		
7.3	15757	Roofing	sq2	4,15 \$	13 393,45 \$	51 998,10 \$	743	65 391,55 \$	58 852,40 \$	75 200,28 \$		
7.4	15757	Finition	sq2	2,75 \$	11 502,61 \$	31 829,14 \$	455	43 331,75 \$	38 998,58 \$	49 831,51 \$		
8	5890	Concrete slab	sq2									
8.1	5890	Insulation	sq2	5,75 \$	13 723,70 \$	20 143,80 \$	288	33 867,50 \$	30 480,75 \$	38 947,63 \$		
8.2	5890	Concrete and finition	sq2	7,25 \$	16 333,71 \$	26 368,79 \$	377	42 702,50 \$	38 432,25 \$	49 107,88 \$	Mat price includes pump	
9	2108	Interior walls	sq									
9.1	2108	Framing	sq	38,50 \$	33 517,20 \$	47 640,80 \$	681	81 158,00 \$	73 042,20 \$	93 331,70 \$		
9.2	6	Stairs	unit	4 250,00 \$	9 753,75 \$	15 746,25 \$	225	25 500,00 \$	22 950,00 \$	29 325,00 \$		
9.3	114	Interior doors	unit	475,00 \$	26 869,80 \$	27 280,20 \$	390	54 150,00 \$	48 735,00 \$	62 272,50 \$		
9.4	44047	Driveway	sq2	2,15 \$	25 987,75 \$	68 713,32 \$	982	94 701,05 \$	85 230,95 \$	108 906,21 \$		
9.5	39207	Plastering	sq2	1,00 \$	9 017,61 \$	30 189,39 \$	431	39 207,00 \$	35 286,30 \$	45 088,05 \$		
9.6	39207	Painting	sq2	1,80 \$	19 478,04 \$	51 094,56 \$	730	70 572,60 \$	63 515,34 \$	81 158,49 \$		



Project: Six Plex
Project Nu : 028-19011
Prepared by : Jean Larouche
Type : New building
Location : Eastmain


Date : March 4th 2019
Revision 0

									Contingency Class B		
ID	Qty	Description	unit	PU	Material	Labor	Man-hours	Sub-total	-10%	15%	Notes
10	6	Plumbing	gl								
10.1	6	Water input	gl	2 650,00 \$	7 155,00 \$	8 745,00 \$	125	15 900,00 \$	14 310,00 \$	18 285,00 \$	
10.2	6	Distribution	gl	11 750,00 \$	31 725,00 \$	38 775,00 \$	554	70 500,00 \$	63 450,00 \$	81 075,00 \$	
10.3	6	Accessories	gl	5 350,00 \$	24 075,00 \$	8 025,00 \$	115	31 100,00 \$	28 890,00 \$	36 915,00 \$	
11	6	Electricity									
11.1	6	Electric input	gl	4 150,00 \$	16 185,00 \$	8 715,00 \$	125	24 900,00 \$	22 410,00 \$	28 635,00 \$	
11.2	6	Distribution	gl	10 150,00 \$	27 405,00 \$	33 495,00 \$	479	60 900,00 \$	54 810,00 \$	70 035,00 \$	
11.3	6	Lighting/accessories/fixtures	gl	2 500,00 \$	11 250,00 \$	3 750,00 \$	54	15 000,00 \$	13 500,00 \$	17 250,00 \$	
12	6	Ventilation									Bid for HVAC equipment
12.1	6	HVAC unit	gl	11 175,00 \$	53 640,00 \$	13 410,00 \$	192	67 050,00 \$	60 345,00 \$	77 107,50 \$	
12.2	6	Distribution	gl	8 750,00 \$	26 250,00 \$	26 250,00 \$	375	52 500,00 \$	47 250,00 \$	60 375,00 \$	
12.3	6	Grid and accessories	gl	2 050,00 \$	6 150,00 \$	6 150,00 \$	88	12 300,00 \$	11 070,00 \$	14 145,00 \$	
13	6	Cabinet making	gl	11 200,00 \$	60 480,00 \$	6 720,00 \$	96	67 200,00 \$	60 480,00 \$	77 280,00 \$	
14	6	Electricity (Hydro-Quebec)	gl	- \$	- \$	- \$	-	- \$	- \$	- \$	
15	6	Wood Sowe	gl	11 100,00 \$	59 940,00 \$	6 660,00 \$	95	66 600,00 \$	59 940,00 \$	76 590,00 \$	Bid for equipment
				Material from Rona :	355 001,77 \$						
				Total :	881 809,44 \$	941 498,26 \$	13 450	1 823 307,70 \$	1 640 976,93 \$	2 096 803,86 \$	
				Building area	8185 sq2		Cost by sq2:	222,76 \$	200,49 \$	256,18 \$	

Assumptions

Materials costs by Rona from edmonton contractor estimate (transport to Eastmain included)  
Labor: 60% of the workers are locals (\$05/h) and 40% of the workers are externals (100\$/h including lodging, catering and transport)  
No project management included


Figure 13. Starter House

		Project: Home Ownership	Date: March 4th 2019	
		Project Nu: 028-19011	Revision 0	
		Prepared by: Jean Larouche		
		Type: New building		
		Location: Eastmain		

ID	Qty	Description	unit	PU	Material	Labor	Man-hours	Sub-total	Contingency Class B		Notes
									-10%	15%	
1	1	Water input	gl	2 750,00 \$	1 925,00 \$	825,00 \$	12	2 750,00 \$	2 475,00 \$	3 162,50 \$	
2	180,00	Excavation/embankment	m3	31,50 \$	3 960,00 \$	1 701,00 \$	24	5 670,00 \$	5 103,00 \$	6 520,50 \$	Mat included excavation equipment
3	14	Foundations	m3		19 948,19 \$	34 501,81 \$	493	54 450,00 \$	49 005,00 \$	62 617,50 \$	Concrete: 300\$/m3, mat includes pump
3.1	12	Main footing	m3	1 925,00 \$	- \$	- \$	-	- \$	- \$	- \$	
3.2	2	Isolated footing	m3	1 050,00 \$	- \$	- \$	-	- \$	- \$	- \$	
3.3	1080	Isolated foundation walls	sq2	33,75 \$	- \$	- \$	-	- \$	- \$	- \$	
4	1992	Building exterior walls	sq2								
4.1	1992	Structure	sq2	8,75 \$	10 776,72 \$	6 653,28 \$	95	17 430,00 \$	15 687,00 \$	20 044,50 \$	
4.2	1992	Insulation	sq2	4,20 \$	3 625,44 \$	4 740,96 \$	68	8 366,40 \$	7 529,76 \$	9 621,36 \$	
4.3	2575	Outdoor siding (Canexel)	sq2	14,75 \$	8 188,50 \$	29 792,75 \$	426	37 981,25 \$	34 183,13 \$	43 678,44 \$	
4.4	1	Doors and windows (triple glasses)	gl	27 500,00 \$	22 000,00 \$	5 500,00 \$	79	27 500,00 \$	24 750,00 \$	31 625,00 \$	1 bid for windows
5	1585	Main floor	sq2								
5.1	1585	Structure	sq2	9,50 \$	5 642,60 \$	9 414,90 \$	134	15 057,50 \$	13 551,75 \$	17 316,13 \$	
5.2	1585	Flooring	sq2	7,50 \$	5 349,38 \$	6 538,13 \$	93	11 887,50 \$	10 698,75 \$	13 670,63 \$	Includes ceramic and vinyl (no price from rona for material)
6	1900	Roof	sq2								
6.1	1900	Structure	sq2	14,50 \$	8 151,00 \$	19 399,00 \$	277	27 550,00 \$	24 795,00 \$	31 682,50 \$	Includes lifting equipment
6.2	810	Insulation	sq2	4,50 \$	2 389,50 \$	1 255,50 \$	18	3 645,00 \$	3 280,50 \$	4 191,75 \$	
6.3	1900	Roofing	sq2	4,35 \$	1 615,00 \$	6 650,00 \$	95	8 265,00 \$	7 438,50 \$	9 504,75 \$	
6.4	1900	Fusion	sq2	3,15 \$	1 387,00 \$	4 598,00 \$	66	5 985,00 \$	5 386,50 \$	6 882,75 \$	
7	835	Concrete slab	sq2								
7.1	835	Insulation	sq2	5,75 \$	1 945,55 \$	2 855,70 \$	41	4 801,25 \$	4 321,13 \$	5 521,44 \$	
7.2	835	Concrete and finish	sq2	7,25 \$	2 315,56 \$	3 738,19 \$	53	6 053,75 \$	5 448,38 \$	6 961,81 \$	Mat price includes pump
8	2108	Interior walls	sq								
8.1	155	Framing	sq	38,50 \$	2 464,50 \$	3 503,00 \$	50	5 967,50 \$	5 370,75 \$	6 862,63 \$	
8.2	15	Interior doors	unit/le	475,00 \$	3 535,50 \$	3 589,50 \$	51	7 125,00 \$	6 412,50 \$	8 193,75 \$	
8.3	2825	Drywall	sq2	2,15 \$	1 666,75 \$	4 407,00 \$	63	6 073,75 \$	5 466,38 \$	6 984,81 \$	
8.4	2825	Plastering	sq2	1,00 \$	649,75 \$	2 175,25 \$	31	2 825,00 \$	2 542,50 \$	3 248,75 \$	
8.5	2825	Painting	sq2	1,80 \$	1 403,46 \$	3 681,54 \$	53	5 085,00 \$	4 576,50 \$	5 847,75 \$	
8.5	3250	Painting	sq2	3,80 \$	1 614,60 \$	4 235,40 \$	61	5 850,00 \$	5 265,00 \$	6 727,90 \$	

		Project: Home Ownership	Date: March 4th 2019	
		Project Nu: 028-19011	Revision 0	
		Prepared by: Jean Larouche		
		Type: New building		
		Location: Eastmain		

ID	Qty	Description	unit	PU	Material	Labor	Man-hours	Sub-total	Contingency Class B		Notes
									-10%	15%	
9	1	Plumbing	gl								
9.1	1	Water input	gl	2 650,00 \$	1 192,50 \$	1 457,50 \$	21	2 650,00 \$	2 385,00 \$	3 047,50 \$	
9.2	1	Distribution	gl	10 500,00 \$	4 725,00 \$	5 775,00 \$	83	10 500,00 \$	9 450,00 \$	12 075,00 \$	
9.3	1	Accessories	gl	3 250,00 \$	2 497,50 \$	812,50 \$	12	3 250,00 \$	2 925,00 \$	3 737,50 \$	
10	1	Electricity	gl								
10.1	1	Electric input	gl	3 500,00 \$	2 275,00 \$	1 225,00 \$	18	3 500,00 \$	3 150,00 \$	4 025,00 \$	
10.2	1	Distribution	gl	12 750,00 \$	5 797,50 \$	7 013,50 \$	100	12 750,00 \$	11 475,00 \$	14 662,50 \$	
10.3	1	Lighting/accessories/fixtures	gl	3 150,00 \$	2 362,50 \$	787,50 \$	11	3 150,00 \$	2 835,00 \$	3 622,50 \$	
11	1	Ventilation	gl								
11.1	1	HVAC unit	gl	12 500,00 \$	10 000,00 \$	2 500,00 \$	36	12 500,00 \$	11 250,00 \$	14 375,00 \$	Bid for HVAC equipment
11.2	1	Distribution	gl	12 000,00 \$	6 000,00 \$	6 000,00 \$	86	12 000,00 \$	10 800,00 \$	13 800,00 \$	
11.3	1	Grid and accessories	gl	2 050,00 \$	1 025,00 \$	1 025,00 \$	15	2 050,00 \$	1 845,00 \$	2 357,50 \$	
12	1	Cabinet making	gl	10 500,00 \$	9 450,00 \$	1 050,00 \$	15	10 500,00 \$	9 450,00 \$	12 075,00 \$	
13	1	Electricity (Hydro-Quebec)	gl	- \$	- \$	- \$	-	- \$	- \$	- \$	
14	1	Wood Stove	gl	11 100,00 \$	9 990,00 \$	1 110,00 \$	16	11 100,00 \$	9 990,00 \$	12 765,00 \$	Bid for equipment
					Materials from Rona:						
							73 651,81 \$				
					Total:	164 143,39 \$	184 275,51 \$	2 633	348 418,90 \$	313 577,01 \$	400 681,74 \$
				Building area	1090	sq2			Cost by sq2:	319,65 \$	287,69 \$
										367,60 \$	


**Assumptions**

Materials costs by Rona from edmonton contractor estimate (transport to Eastmain included)

Labor: 60% of the workers are locals (50\$/h) and 40% of the workers are externals (100\$/h including lodging, catering and transport)

No project management included

Figure 14. Elders' House



Project:

Elder's house

Project Nu :

028-19011

Prepared by :

Jean Larouche

Type :

New building

Location :


Eastmain

Date :

March 4th 2019

Revision 0

ID	Qty	Description	unit	PU	Material	Labor	Man-hours	Sub-total	Contingency Class B		Notes
									-10%	15%	
1	1	Water input	gl	2 750,00 \$	1 925,00 \$	825,00 \$	12	2 750,00 \$	2 475,00 \$	3 162,50 \$	
2	220,00	Excavation/ embankment	m3	31,50 \$	4 851,00 \$	2 079,00 \$	30	6 930,00 \$	6 237,00 \$	7 969,50 \$	Mat included excavation equipment Concrete : 300\$/m3, mat includes pump
3	17	Foundations	m3		24 222,80 \$	40 137,20 \$	573	64 360,00 \$	57 924,00 \$	74 014,00 \$	
3.1	14	Main footing	m3	1 325,00 \$	- \$	- \$	-	- \$	- \$	- \$	
3.2	3	Isolated footing	m3	1 050,00 \$	- \$	- \$	-	- \$	- \$	- \$	
3.3	1264	Isolated fundation walls	sq2	33,75 \$	- \$	- \$	-	- \$	- \$	- \$	
4	1743	Building exterior walls	sq2								
4.1	1468	Structure	sq2	7,25 \$	7 941,88 \$	2 701,12 \$	39	10 643,00 \$	9 578,70 \$	12 239,45 \$	
4.2	1468	Insulation	sq2	4,20 \$	2 671,76 \$	3 493,84 \$	50	6 165,60 \$	5 549,04 \$	7 090,44 \$	
4.3	1468	Outdoor siding (Canexel)	sq2	15,50 \$	4 668,24 \$	18 085,76 \$	258	22 754,00 \$	20 478,60 \$	26 167,10 \$	
4.4	1	Doors and windows (triple glasses)	gl	20 250,00 \$	16 200,00 \$	4 050,00 \$	58	20 250,00 \$	18 225,00 \$	23 287,50 \$	1 bid for windows
5	1462,5	Main floor	sq2								
5.1	1350	Structure	sq2	9,50 \$	4 806,00 \$	8 019,00 \$	115	12 825,00 \$	11 542,50 \$	14 748,75 \$	
5.2	1350	Flooring	sq2	7,50 \$	4 556,25 \$	5 568,75 \$	80	10 125,00 \$	9 112,50 \$	11 643,75 \$	Includes ceramic and vinyl (no price from rona for material)
6	1986	Roof	sq2								
6.1	1986	Structure	sq2	12,50 \$	8 519,84 \$	16 305,06 \$	233	24 825,00 \$	22 342,50 \$	28 548,75 \$	Includes lifting equipment
6.2	1520	Insulation	sq2	4,50 \$	4 484,00 \$	2 356,00 \$	34	6 840,00 \$	6 156,00 \$	7 866,00 \$	
6.3	1986	Roofing	sq2	4,15 \$	1 688,10 \$	6 553,80 \$	94	8 241,90 \$	7 417,71 \$	9 478,19 \$	
6.4	1986	Finition	sq2	2,75 \$	1 449,78 \$	4 011,72 \$	57	5 461,50 \$	4 915,35 \$	6 280,73 \$	
7	1462,5	Concrete slab	sq2								
7.1	1190	Insulation	sq2	5,75 \$	2 772,70 \$	4 069,80 \$	58	6 842,50 \$	6 158,25 \$	7 868,88 \$	
7.2	1190	Concrete and finition	sq2	7,25 \$	3 300,02 \$	5 327,48 \$	76	8 627,50 \$	7 764,75 \$	9 921,63 \$	Mat price includes pump
8	2108	Interior walls	sq								
8.1	110	Framing	sq	38,50 \$	1 749,00 \$	2 486,00 \$	36	4 235,00 \$	3 811,50 \$	4 870,25 \$	
8.2	12	Interior doors	unitée	475,00 \$	2 828,40 \$	2 871,60 \$	41	5 700,00 \$	5 130,00 \$	6 555,00 \$	
8.3	2350	Drywall	sq2	2,15 \$	1 386,50 \$	3 666,00 \$	52	5 052,50 \$	4 547,25 \$	5 810,38 \$	
8.4	2350	Plastering	sq2	1,00 \$	540,50 \$	1 809,50 \$	26	2 350,00 \$	2 115,00 \$	2 702,50 \$	
8.5	2350	Painting	sq2	1,80 \$	1 167,48 \$	3 062,52 \$	44	4 230,00 \$	3 807,00 \$	4 864,50 \$	

		Project:	Elder's house		Date:	March 4th 2019					
		Project Nu :	028-19011		Revision 0						
		Prepared by :	Jean Larouche								
		Type :	New building								
		Location :	Eastmain								
						Contingency Class B					
ID	Qty	Description	unit	PU	Material	Labor	Man-hours	Sub-total	-10%	15%	Notes
9	1	Plumbing	gl								
9.1	1	Water input	gl	2 650,00 \$	1 192,50 \$	1 457,50 \$	21	2 650,00 \$	2 385,00 \$	3 047,50 \$	
9.2	1	Distribution	gl	9 150,00 \$	4 117,50 \$	5 032,50 \$	72	9 150,00 \$	8 235,00 \$	10 522,50 \$	
9.3	1	Accessories	gl	3 250,00 \$	2 437,50 \$	812,50 \$	12	3 250,00 \$	2 925,00 \$	3 737,50 \$	
10	1	Electricity									
10.1	1	Electric input	gl	3 500,00 \$	2 275,00 \$	1 225,00 \$	18	3 500,00 \$	3 150,00 \$	4 025,00 \$	
10.2	1	Distribution	gl	9 150,00 \$	4 117,50 \$	5 032,50 \$	72	9 150,00 \$	8 235,00 \$	10 522,50 \$	
10.3	1	Lighting/accessories/fixtures	gl	3 150,00 \$	2 362,50 \$	787,50 \$	11	3 150,00 \$	2 835,00 \$	3 622,50 \$	
11	1	Ventilation									
11.1	1	HVAC unit	gl	10 250,00 \$	8 200,00 \$	2 050,00 \$	29	10 250,00 \$	9 225,00 \$	11 787,50 \$	Bid for HVAC equipment
11.2	1	Distribution	gl	9 000,00 \$	4 500,00 \$	4 500,00 \$	64	9 000,00 \$	8 100,00 \$	10 350,00 \$	
11.3	1	Grid and accessories	gl	2 050,00 \$	1 025,00 \$	1 025,00 \$	15	2 050,00 \$	1 845,00 \$	2 357,50 \$	
12	1	Cabinet making	gl	10 500,00 \$	9 450,00 \$	1 050,00 \$	15	10 500,00 \$	9 450,00 \$	12 075,00 \$	
13	1	Electricity (Hydro-Quebec)	gl	- \$	- \$	- \$	-	- \$	- \$	- \$	
14	1	Wood Stove	gl	11 100,00 \$	9 990,00 \$	1 110,00 \$	16	11 100,00 \$	9 990,00 \$	12 765,00 \$	Bid for equipment
			Materials from Rona :		72 489.12 \$						
			Total :		151 396,85 \$		161 561,65 \$		2 308		
							312 958,50 \$		281 662,65 \$		359 902,28 \$
			Building area		1350 sq2		Cost by sq2:		\$ 231,82 \$ 208,64 \$ 266,59		


**Assumptions**

Materials costs by Rona from edmonton contractor estimate (transport to Eastmain included)

Labor: 60% of the workers are locals (50\$/h) and 40% of the workers are externals (100\$/h including lodging, catering and transport)

No project management included

Figure 15. Class D NZE Retrofit

		Project: House retrofit	Date: March 4th 2019
		Project Nu: 028-19011	Revision 0
		Prepared by: Jean Larouche	
		Type: Existing building renovation	
		Location: Eastmain	

ID	Qty	Description	Unit	PU	Material	Labor	Man-hours	Sub-total	Contingency Class B		Notes
									10%	15%	
1	0	Water Input	gl	2 750,00 \$	- \$	- \$	-	- \$	- \$	- \$	
2	145,00	Excavation/embankment	m3	31,50 \$	3 197,25 \$	1 370,25 \$	20	4 567,50 \$	4 110,75 \$	5 252,63 \$	Mat included excavation equipment
3	0	Foundations	m3	-	- \$	17 064,00 \$	244	17 064,00 \$	15 357,60 \$	19 623,60 \$	Concrete: 3005/m3, mat includes pump
3.1	0	Main footing	m3	1 325,00 \$	- \$	- \$	-	- \$	- \$	- \$	
3.2	0	Isolated footing	m3	1 050,00 \$	- \$	- \$	-	- \$	- \$	- \$	
3.3	1264	Isolated foundation walls	sq2	13,50 \$	- \$	- \$	-	- \$	- \$	- \$	
4	2362,5	Building exterior walls	sq2	-	- \$	- \$	-	- \$	- \$	- \$	
4.1	2362,5	Structure	sq2	10,75 \$	12 781,13 \$	12 615,75 \$	180	25 396,88 \$	22 857,19 \$	29 206,41 \$	
4.2	2362,5	Insulation	sq2	4,20 \$	4 299,75 \$	5 622,75 \$	80	9 922,50 \$	8 930,25 \$	11 410,88 \$	
4.3	2362,5	Outdoor siding (Canexel)	sq2	15,50 \$	7 512,75 \$	29 106,00 \$	416	36 618,75 \$	32 956,88 \$	42 111,56 \$	
4.4	1	Doors and windows (triple glasses)	gl	26 250,00 \$	21 000,00 \$	5 250,00 \$	75	26 250,00 \$	23 625,00 \$	30 187,50 \$	1 bid for windows
5	1700	Roof	sq2	-	- \$	- \$	-	- \$	- \$	- \$	
5.1	1700	Structure	sq2	12,50 \$	7 293,00 \$	13 957,00 \$	199	21 250,00 \$	19 125,00 \$	24 437,50 \$	Includes lifting equipment
5.2	1485	Insulation	sq2	6,75 \$	4 380,75 \$	5 643,00 \$	81	10 023,75 \$	9 021,38 \$	11 527,31 \$	
5.3	1700	Roofing	sq2	4,15 \$	1 445,00 \$	5 610,00 \$	80	7 055,00 \$	6 349,50 \$	8 113,25 \$	
5.4	1700	Finion	sq2	2,75 \$	1 241,00 \$	3 434,00 \$	49	4 675,00 \$	4 207,50 \$	5 376,25 \$	
6	1462,5	Concrete slab	sq2	-	- \$	- \$	-	- \$	- \$	- \$	
6.1	1134	Insulation	sq2	5,75 \$	2 642,22 \$	3 878,28 \$	55	6 520,50 \$	5 868,45 \$	7 498,58 \$	
6.2	1134	Concrete and finion	sq2	7,25 \$	3 144,72 \$	5 076,78 \$	73	8 221,50 \$	7 399,35 \$	9 454,73 \$	Mat price includes pump
Material from Rona:					44 740,32 \$	-	-	-	-	-	
<b>Total:</b>					<b>68 937,57 \$</b>	<b>108 627,81 \$</b>	<b>1 552</b>	<b>177 565,38 \$</b>	<b>159 808,84 \$</b>	<b>204 200,18 \$</b>	
Building area				1134 sq2	Cost by sq2:		\$ 156,58	\$ 140,92	\$ 180,07		

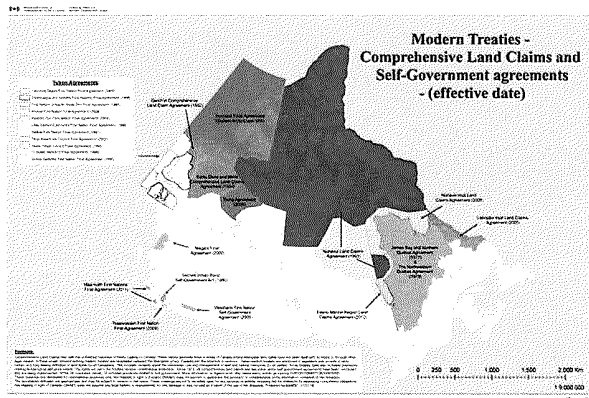
**Assumptions**  
 Materials costs by Rona from edmonton contractor estimate (transport to Eastmain included)  
 Labor: 60% of the workers are locals (50\$/h) and 40% of the workers are externals (100\$/h including lodging, catering and transport)  
 No project management included

## CHAPTER 9: IMPLEMENTATION PHASE

### Duty to Consult with Indigenous groups

The CNE is an Indigenous group, having recognized and constitutionally-protected land rights in Eeyou Istchee, the territory where it will carry out its Net-Zero Housing Program. As such, the CNE is not subject to the duty to consult.

Figure 16. Treaties Map



### Modern Treaty Obligations

The CNE is one of the signatories to the James Bay and Northern Quebec Agreement, Canada's first modern-day treaty. The CNE therefore does not have any obligations, in the context of its NZE program, under federal or provincial legislation with respect to Indigenous treaty rights.

### **Community Employment Benefit (CEB)**

If selected as the \$5M category winner of the Smart Cities Challenge, the CNE will report on the Community Employment Benefit for Indigenous people. Its NZE program is inclusive in that it offers employment and business opportunities to youth, women and apprentices for skilled trades. Tendering for work that will be carried out under the NZE program will prioritise small, local Indigenous business and tradespeople.

Already the CNE has hired 3 youth under a work placement program to gain experience with the project management team and McGill University. The CNE will engage other youth as part of the trades training initiative under the NZE program. We will also target employment for youth with disabilities.

Part of our project management team includes an Indigenous-owned and operated engineering firm. The CNE will support Indigenous businesses as part of our procurement process.

### **Climate Lens Assessment (CLA)**

Climate Lens Assessment is not applicable to CNE's project due to it being within the \$5M category.

# 2018-2021 STRATEGIC PLAN

CREE NATION OF EASTMAIN ADMINISTRATION

## GOVERNANCE



Develop strong processes and levels of accountability and expect high level of ethical conduct. Ensure the mobilization of the community and employees through transparent communication and meaningful dialogue.

### OBJECTIVES

1. Implement new technologies and processes to improve organizational management and cost control: HRMS, GIS and Asset management
2. Develop strategic plans for the CNE
3. Ensure impactful communication with community members and keep members up to date on deliverables and obtain feedback to improve
4. Update regularly Council of the administration's plans
5. Complete the update of all CNE administrative policies and procedures
6. Ensure the departments start working on their operational policies and procedures

## FINANCE & ECONOMY



Establish budgets that reflect the CNE's capacity to pay. Offer quality employment to the community members and promote entrepreneurship.

### OBJECTIVES

1. Develop a short and long-term strategy on how the local economy can grow without the main governmental employer
2. Ensure implementation of new business log and registry system
3. Implement the purchasing law
4. Develop and implement procedures to improve debt collection
5. Re-evaluate the CNE's 5 year capital plan

## ENVIRONMENT



Occupy and develop the territory in a sustainable way, protecting and preserving the land and its resources.

### OBJECTIVES

1. Implement the zoning law
2. Map the hydrology of Eastmain territory
3. Complete geomorphic study of all proposed development areas

## CULTURE



Respect and promote Cree culture and ways of life in all aspects of the CNE decisions and dealings.

### OBJECTIVES

1. Assess the programs offered in collaboration with the Department of Culture and Recreation and ensure emphasis is placed on cultural related programs and activities
2. Ensure annual reporting to the members and the CNE's website are available in both Cree and English

## EDUCATION



Promote education and professional development at the CNE. Encourage the members to pursue their education to build capacity.

### OBJECTIVES

1. Continue to offer the courses leading to a certificate in Administration from UQAT
2. Offer training for the certificate in hydrogeology and GIS for the ground water acquisition project
3. Ensure the new succession plan helps build capacity

## HEALTH, SAFETY AND WELLBEING



Protect and enhance the health & safety and wellbeing of the population of the CNE through well targeted social programs, sufficient quality housing and crime prevention initiatives.

### OBJECTIVES

1. Develop a well-defined housing strategy to improve the quality of the houses that are being built, to reduce their construction costs, to increase the availability of houses units in the community
2. Obtain necessary funding for the first 3 years of the implementation of the housing strategy

## — VISION —



To be a self-sufficient Nation, proud of its heritage, that offers a friendly environment, good quality of life and a better place to live and grow for future generations.

## — MISSION —



Together provide the highest quality services to members so that they may develop and prosper economically, socially and culturally.



These objectives will be reached with the collaboration of local and regional Cree entities and organizations.



## **Video – Project Overview - Eastmain Net-Zero Energy Project**

Cree Nation of Eastmain, an indigenous community rich in its cultural traditions.; Located in northern Quebec and consisting over 860 residents; the community is facing a significant housing shortage and issues with poor-quality housing.

For our challenge, “Improving Community well-being”, we will develop an affordable Net Zero Energy Housing Program, offering culturally appropriate designs, smart home technologies, innovative building techniques and solar energy systems in order to improve housing quality and affordability.

To carry this out, we are building capacity within the community by establishing a building component assembly facility and training for the construction trades. Our program will focus on the design and construction of culturally appropriate “smart” NZE Multi-unit homes, single family homes and NZE retrofits on existing homes.

As housing is often cited as the most significant issue in Indigenous communities, the NZE program will have a positive impact on the many socio-economic issues facing CNE, and other Indigenous communities. The project will:

- Reduce our housing backlog by 50% with the construction five Multi-unit NZE homes and five NZE single family homes over a period of six years.
- Reduce operating costs
- Develop the required skills to construct, maintain and sustain the Eastmain NZE Program.
- Establish Eastmain as a resource for other indigenous communities wishing to implement NZE Programs
- Create pride amongst members through engagement and consultation

To help ensure the affordability of its NZE Program; the CNE will establish a comprehensive costing regime for tracking material and labour costs and reduce overall construction cost through the local manufacture of building components through a dedicated building component assembly facility.

Over a three-year period, we will collect data and closely monitor the NZE houses to evaluate energy performance, energy production and indoor air quality This will include establishing a home-based system that will allow homeowners and occupants to track energy consumption patterns and household energy production. Data Collected and lessons learned from these projects will foster the next generation of housing in Eastmain, enhance social inclusiveness, grow our local economy, and set the groundwork for a healthy community and environment.

# **HOT2000**

Natural Resources CANADA  
Version v11.5



**File:** Accessible House1 PV  
House

**Weather Library:** C:\HOT2000 v11.5b8\Dat\Wth110.dir  
**Weather Data for:** BIG TROUT LAKE, ONTARIO

**Builder Code:** 4G01P99999

**Data Entry by:** Ross Elliott

**Date of entry:** 2018-12-06

**Company:** Homesol Building Solutions  
Inc.

**Client name:** Accessible House,  
Eastmain

**Street address:** 123 Anystreet

**City:** Eastmain

**Region:** QUEBEC

**Postal code:** J0M0B3

**Telephone:**

**Mailing address:** 123 Anystreet

**City:** Eastmain

**Region:** QUEBEC

**Postal Code:** J0M0B3

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## **GENERAL HOUSE CHARACTERISTICS**

**House type:** Single Detached

**Number of storeys:** One storey

**Plan shape:**

**Front orientation:** South

**Year House Built:** 2019

**Wall colour:** Default

**Absorptivity:** 0.40

**Roof colour:** Default

**Absorptivity:** 0.40

**Soil Condition:** Normal conductivity (dry  
sand, loam, clay)

**Water Table Level:** Normal (7-10m/23-33ft)

**House Thermal Mass  
Level:** (A) Light, wood frame

**Effective mass fraction** 1.000

**Occupants :** 2 Adults for 50.0% of the time

1 Children for 50.0% of the time 0  
Infants for 0.0% of the time

**Sensible Internal Heat  
Gain From Occupants:**

2.00 kWh/day

## HOUSE TEMPERATURES

### Heating Temperatures

Main Floor	Daytime Setpoint:	69.8 °F
	Nighttime Setpoint:	64.4 °F
	Nighttime Setback	8.0 Hours
	Duration:	
Basement	24 Hour Average:	68.0 °F
	Setpoint:	66.2 °F
	TEMP. Rise from 68.0 °F:	9.9 °F

Cooling Temperature: Main Floor : 77.00 °F

Basement is- Heated:No Cooled: No Separate T/S: Yes  
 Fraction of internal gains released in basement : 0.150

### Indoor design temperatures for equipment sizing

Heating:	71.6 °F
Cooling:	75.2 °F

## WINDOW CHARACTERISTICS

Label	Location	#	Overhang Width (ft)	Header Height (ft)	Tilt deg	Curtain Factor	Shutter (R)
<b>South</b>							
Window - 1	Door - E	1	1.50	1.00	90.0	1.00	0.00
Window - A	Wall - 1	4	1.50	1.00	90.0	1.00	0.00
Window - C	Wall - 1	2	1.50	1.00	90.0	1.00	0.00
<b>North</b>							
Window - A	Wall - 1	1	0.00	0.00	90.0	1.00	0.00
Window - B	Wall - 1	1	0.00	0.00	90.0	1.00	0.00
<b>West</b>							
Window - A	Wall - 1	1	0.00	0.00	90.0	1.00	0.00

Label	Type	#	Window Width (ft)	Window Height (ft)	Total Area (ft <sup>2</sup> )	Window R	SHGC	ER*
<b>South</b>								
Window - 1	EASTMAIN DUX	1	1.67	5.33	8.89	5.985	0.3390	37.6
Window - A	EASTMAIN DUX	4	3.00	4.00	48.00	4.974	0.3683	36.0
Window - C	EASTMAIN DUX	2	5.00	5.00	50.00	4.364	0.3937	34.0
<b>North</b>								
Window - A	EASTMAIN	1	3.00	4.00	12.00	4.974	0.3683	35.4

<b>Window - B</b>	DUX							
	EASTMAIN	1	2.00	4.00	8.00	5.688	0.3452	36.8
	DUX							
<b>West</b>								
<b>Window - A</b>	EASTMAIN	1	3.00	4.00	12.00	4.974	0.3683	35.4
	DUX							

\*ER Window Energy Rating (ER 2009) estimated for actual dimensions, and Air tightness type: CSA - A3; Leakage rate = 0.50 L/s.m<sup>2</sup>

Above grade fraction of wall area occupied by windows: 11.9 %

\*\*\* TYPE 2 USER DEFINED WINDOW CODES \*\*\*

Code Label	Description	Glazing Type	Fill Gas	Thermal Resistance	SHGC	Window Style	Low -E Coating	Frame Height
EASTMAIN DUX	cardinal 272, 2 coats, argon R-7.69, U-overall 0.18, SHGC 0.35,	Double/double with 1 coat	Argon	1.0221 Btu/hr-ft2-F	0.3500	Casement	Hard Coat	50.80
EASTMAIN DUX	cardinal 272, 2 coats, argon R-7.69, U-overall 0.18, SHGC 0.35,	Double/double with 1 coat	Argon	1.0221 Btu/hr-ft2-F	0.3500	Casement	Hard Coat	50.80
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**BUILDING PARAMETER DETAILS****CEILING COMPONENTS**

	<b>Construction Type</b>	<b>Code Type</b>	<b>Roof Slope</b>	<b>Heel Ht. (ft)</b>	<b>Section Area (ft<sup>2</sup>)</b>	<b>R. Value (R)</b>
<b>Ceiling - 1</b>	Attic/gable	EASTMAIN R80	7.992/12	2.00	1012.05	80.66

**MAIN WALL COMPONENTS**

<b>Label</b>	<b>Lintel Type</b>	<b>Fac. Dir</b>	<b>Number of Corn.</b>	<b>Number of Inter.</b>	<b>Height (ft)</b>	<b>Perim. (ft)</b>	<b>Area (ft<sup>2</sup>)</b>	<b>R. Value (R)</b>
<b>Wall - 1</b> Type: EASTMAIN DBLSTUD	N/A	N/A	2	6	8.00	109.42	875.36	46.76
<b>Wall - BUFFERED</b> Type: EASTMAIN DBLSTUD	N/A	N/A	2	3	8.00	23.58	188.64	> 47.59

> Indicates that the component is adjacent to an enclosed unconditioned space.

**DOORS**

<b>Label</b>	<b>Type</b>	<b>Height (ft)</b>	<b>Width (ft)</b>	<b>Gross Area (ft<sup>2</sup>)</b>	<b>R. Value (R)</b>
<b>Door - 1</b> Loc: Wall - BUFFERED	Fibreglass Medium density spray foam core	6.83	3.17	21.64	> 6.47
<b>Door - E Loc: Wall - 1</b>	Fibreglass Medium density spray foam core	6.83	3.17	21.64	5.56

> Indicates that the component is adjacent to an enclosed unconditioned space.

**USER-DEFINED STRUCTURE CODES SCHEDULE**

<b>Name</b>	<b>Description</b>
11EASTMAIN DBLSTUD	New code description
21EASTMAIN R80	New code description
@EASTMAIN ICF	New code description

**FOUNDATIONS**

<b>Foundation Name:</b>	Basement - 2	<b>Volume:</b>	5060.3 ft <sup>3</sup>
<b>Foundation Type:</b>	Basement	<b>Opening to Main Floor:</b>	0.00 ft <sup>2</sup>
<b>Data Type:</b>	Library		
<b>Total Wall Height:</b>	5.00 ft	<b>Rectangular</b>	

<b>Depth Below Grade:</b> 4.25 ft	<b>Floor Length:</b> 42.92 ft
	<b>Floor Width:</b> 23.58 ft
<b>Interior wall type:</b> EASTMAIN ICF	<b>R-value:</b> 59.45 R
<b>Exterior wall type:</b> User specified	<b>R-Value:</b> 0.00 R
<b>Number of corners :</b> 1	
<b>Lintel type:</b> N/A	
<b>Added to slab type :</b> N/A	<b>R-Value:</b> 24.00 R
<b>Floors Above</b> 4231006600	<b>R-Value:</b> 4.01 R
<b>Found.:</b>	

**Exposed areas for:** Basement - 2  
**Exposed Perimeter:** 133.00 ft

Configuration: BCCB\_4  
 - concrete walls and floor  
 - interior surface of wall insulated over full-height  
 - exterior surface of wall insulated over full-height  
 - sub-surface of floor slab fully insulated but no insulation under footings  
 - thermal-break between walls and floor slab  
 - any first storey construction type

#### FOUNDATION CODE SCHEDULE

##### Interior Wall

Name	Code	Description (Fram., Spac., Studs, Ins/fram., Xtra ins, Int)
EASTMAIN ICF	@EASTMAIN ICF	N/A, N/A, N/A, Expanded Polystyrene(EPS II), 76 mm (3 in) EPS I, N/A, N/A, N/A, N/A

##### Floors Above Foundation

Name	Internal Code	Description (Structure, typ/size, Spacing, Insul1, 2, Int., Sheathing, Exterior, Drop Framing)
4231006600	4231006600	Wood frame, 38x235 mm (2x10 in), 400 mm (16 in), None, None, Wood, Plywood/Particle board 15.5 mm (5/8 in), None, No

#### ROOF CAVITY INPUTS

<b>Gable Ends</b>	<b>Total Area:</b>	224.68 ft <sup>2</sup>
<b>Sheathing Material</b> Plywood/Part. bd 9.5 mm (3/8 in)		0.47 R
<b>Exterior Material:</b> Hollow metal/vinyl cladding		0.62 R
<b>Sloped Roof</b>	<b>Total Area:</b>	1215.96 ft <sup>2</sup>
<b>Sheathing Material</b> Plywood/Part. bd 12.7 mm (1/2 in)		0.63 R
<b>Exterior Material:</b> Asphalt shingles		0.44 R
<b>Total Cavity Volume:</b> 4376.9 ft <sup>3</sup>	<b>Ventilation Rate:</b>	0.50 ACH/hr

**BUILDING ASSEMBLY DETAILS**

Label	Construction Code	Nominal (R)	System (R)	Effective (R)
<b>CEILING COMPONENTS</b>				
Ceiling - 1	EASTMAIN R80	80.28	80.66	80.66
<b>MAIN WALL COMPONENTS</b>				
Wall - 1	EASTMAIN DBLSTUD	48.65	46.76	46.76
Wall - BUFFERED	EASTMAIN DBLSTUD	48.65	46.68	46.68
<b>FLOORS ABOVE BASEMENTS</b>				
Basement - 2	4231006600	0.00	4.01	4.01

**BUILDING PARAMETERS SUMMARY****ZONE 1 : Above Grade**

Component	Area ft <sup>2</sup> Gross	Area ft <sup>2</sup> Net	Effective (R)	Heat Loss Mil.BTU	% Annual Heat Loss
Ceiling	1012.05	1012.05	80.66	4.10	9.49
Main Walls	1064.00	890.72	46.91	6.43	14.88
Doors	43.28	34.39	5.56	2.20	5.10
South Windows	106.89	106.89	4.73	8.05	18.63
North Windows	20.00	20.00	5.24	1.36	3.15
West Windows	12.00	12.00	4.97	0.86	1.99
<b>ZONE 1 Totals:</b>				<b>23.00</b>	<b>53.23</b>

**INTER-ZONE Heat Transfer : Floors Above Basement**

	Area ft <sup>2</sup> Gross	Area ft <sup>2</sup> Net	Effective (R)	Heat Loss Mil.BTU
	1012.05	1012.05	4.008	7.37

**ZONE 2 : Basement**

Component	Area ft <sup>2</sup> Gross	Area ft <sup>2</sup> Net	Effective (R)	Heat Loss Mil.BTU	% Annual Heat Loss
Walls above grade	99.75	99.75	-	2.58	5.98
Below grade foundation	1577.30	1577.30	-	9.81	22.69
<b>ZONE 2 Totals:</b>				<b>12.39</b>	<b>28.67</b>

**Air Leakage and Mechanical Ventilation**

House Volume	Air Change	Heat Loss Mil.BTU	% Annual Heat Loss
12144.61 ft <sup>3</sup>	0.114 ACH	7.819	18.10



---

## AIR LEAKAGE AND MECHANICAL VENTILATION

Building Envelope Surface Area: 3753.10 ft<sup>2</sup>

Air Leakage Test Results at 50 Pa.  
(0.2 in H<sub>2</sub>O) = 0.60 ACH

Equivalent Leakage Area @ 10 Pa  
= 11.90 in<sup>2</sup>

### Terrain Description

@ Weather Station :	Open flat terrain, grass	Anemometer:	Height (ft) 32.8
@ Building site :	Suburban, forest	Height of the highest ceiling:	12.0

### Local Shielding:

Walls:	Heavy
Flue :	Light

### Leakage Fractions-

Ceiling:	0.300
Walls:	0.500
Floors:	0.200

Normalized Leakage Area @ 10 Pa: 0.0032 in<sup>2</sup>/ft<sup>2</sup>

Estimated Airflow to cause a 5 Pa Pressure Difference: 26 cfm

Estimated Airflow to cause a 10 Pa Pressure Difference: 41 cfm

---

## F326 VENTILATION REQUIREMENTS

Kitchen, Living Room, Dining Room	3 rooms @ 2.4 cfm: 31.8 cfm
Bedroom	1 rooms @ 4.7 cfm: 21.2 cfm
Bedroom	1 rooms @ 10.6 cfm: 10.6 cfm
Bathroom	2 rooms @ 2.4 cfm: 21.2 cfm
Basement Rooms	10.6 cfm

---

## CENTRAL VENTILATION SYSTEM

System Type:	HVI Certified HRV
Manufacturer:	vanEE
Model Number:	2400E ECM

Fan and Preheater Power at 32.0 °F: 21 Watts

Fan and Preheater Power at -13.0 °F: 34 Watts

Preheater Capacity: 0 Watts

Sensible Heat Recovery Efficiency at 32.0 °F 84%

Sensible Heat Recovery Efficiency at -13.0 °F 65%

Total Heat Recovery Efficiency in Cooling Mode 68%

Low Temperature Ventilation Reduction: 0%

Low Temperature Ventilation Reduction: 0 cfm (0.0%)  
Airflow Adjustment

NO Vented combustion appliance specified

#### Ventilation Supply Duct

Location:	Main floor	Type:	Flexible
Length:	4.9 ft	Diameter:	6.0 in
Insulation:	8.0 R	Sealing Characteristics:	Very tight

#### Ventilation Exhaust Duct

Location:	Main floor	Type:	Flexible
Length:	4.9 ft	Diameter:	6.0 in
Insulation:	8.0 R	Sealing Characteristics:	Very tight

---

## SECONDARY FANS & OTHER EXHAUST APPLIANCES

	Control	Supply (cfm)	Exhaust (cfm)
Other Fans	Continuous	0.00	7.94
Dryer	Continuous	-	3.16

Dryer is vented outdoors

Rated Fan Power 2.85 Watts

## NEW ERS VENTILATION DATA

### Whole House Systems

Air Distribution/circulation type:	Dedicated low volume ductwork
Air Distribution/circulation fan power:	100.00 Watts
Operation schedule:	480.00 min/day

**System # 1 Type:** HRV  
**Manufacturer:** vanEE  
**Model:** 2400E ECM  
**Airflow Supply Rate:** 95.30 cfm  
**Exhaust:** 95.30 cfm  
**Fan Power:** 21.00 Watts

#### Supplementary Systems

**System # 1 Type:** Dryer  
**Manufacturer:**  
**Model:**  
**Airflow Supply Rate:** 0.00 cfm  
**Exhaust:** 80.52 cfm  
**Fan Power:** 0.00 Watts  
**Operation schedule:** 56.53 min/day

**System # 2 Type:** Range hood  
**Manufacturer:**  
**Model:**  
**Airflow Supply Rate:** 0.00 cfm  
**Exhaust:** 158.90 cfm  
**Fan Power:** 57.00 Watts  
**Operation schedule:** 72.00 min/day

---

#### AIR LEAKAGE AND MECHANICAL VENTILATION SUMMARY

**F326 Required continuous ventilation:** 95.350 cfm (0.47 ACH)  
**Central Ventilation Supply Rate ():** 95.300 cfm (0.47 ACH)  
**Other Continuous Supply Flow Rates:** 0.000 cfm (0.00 ACH)  
**Other Continuous Exhaust Flow Rates:** 7.945 cfm (0.04 ACH)  
**Total house ventilation is Balanced**  
**Gross Air Leakage and Mechanical Ventilation Energy Load:** 8.654 Mil.BTU  
**Seasonal Heat Recovery Ventilator Efficiency:** 78.232 %  
**Estimated Ventilation Electrical Load:** 0.231 Mil.BTU  
**Heating Hours:** 0.009 Mil.BTU  
**Estimated Ventilation Electrical Load:** 0.009 Mil.BTU  
**Non-Heating Hours:** 7.935 Mil.BTU  
**Net Air Leakage and Mechanical Ventilation Load:**

---

**VENTILATION REQUIREMENTS**

Use:	F326
ACH:	0.47
Supply:	95.30 cfm
Exhaust:	95.30 cfm

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**SPACE HEATING SYSTEM**

PRIMARY Space Heating Fuel:	Electricity
Space Heating Equipment:	Air Source Heat Pump
Manufacturer:	Fujitsu
Model:	AHRI 8703348; AOU9RLS3; ASU9RL

Capacity at 47 °F:	11942.5 BTU/h
HSPF at 47 °F:	14.00
COP at 47 °F:	6.04
Crankcase Heater Power:	60.00 watts
Heat Pump Temperature Cut-Off:	Balance point

SECONDARY Heating Fuel:	Electricity
Equipment:	Baseboard/Hydronic/Plenum(duct) htrs.
Manufacturer:	
Model:	
Calculated* Output Capacity:	11942.49 BTU/h
* Design Heat loss X 1.00 + 0.5 kW	
Steady State Efficiency:	100.00 %
Fan Mode:	Auto
ECM Motor:	Yes
Low Speed Fan Power:	0 watts
High Speed Fan Power:	101 watts

---

**AIR CONDITIONING SYSTEM**

System Type:	Mini-split ductless		
Manufacturer:			
Model:			
Capacity:	11669 BTU/hr		
SEER	33.00	Rated COP	4.878
Sensible Heat Ratio:	0.70		
Indoor Fan Flow Rate:	488.95 cfm	Fan Power (watts)	110.33

Ventilator Flow Rate:	0.00 cfm	Crankcase Heater Power (watts):	60.00
Fraction of windows Openable:	0.000	ECM Motor:	Yes
Cooling system capacity sizing factor:	1.000		
Economizer control:	N/A	Indoor Fan Operation:	Auto

Air Conditioner is integrated with the Heating System

---

## DOMESTIC WATER HEATING SYSTEM

PRIMARY Water Heating Fuel:	Electricity		
Water Heating Equipment:	Conserver tank		
Energy Factor:	0.960		
Manufacturer:	Rheem		
Model:	Marathon 50 gallon short		
Tank Capacity:	41.6 Imp Gal	Tank Blanket Insulation:	0.0 R
Tank Location:	Basement		

---

## ANNUAL DOMESTIC WATER HEATING SUMMARY

Daily Hot Water Consumption:	42.9 Imp Gal
Hot Water Temperature:	131.0 °F
Estimated Domestic Water Heating Load:	14.876 Mil.BTU
Primary Domestic Water Heating Energy Consumption:	15.502 Mil.BTU
Primary System Seasonal Efficiency:	96.0%

---

## PHOTOVOLTAIC SYSTEM

Manufacturer:	Canadian Solar	Model:	HiKu 400 watt modules
Array area:	700.0 ft <sup>2</sup>	Slope:	34.0 Degrees
Azimuth:	0.0 Degrees		

Module type:	User Specified
Module efficiency:	15.0%
Normal operating cell temperature:	113.0 °F
Temperature coefficient of efficiency:	0.400 %/°F
Miscellaneous array losses:	3.0% <b>Other</b>
power conditioning losses:	1.0%
Inverter efficiency:	95.0%
PV energy absorption rate:	100.0%

---

### **ANNUAL SPACE HEATING SUMMARY**

Gross Space Heat Loss:	43.212 Mil.BTU
Gross Space Heating Load:	41.365 Mil.BTU
Usable Internal Gains:	20.920 Mil.BTU
Usable Internal Gains Fraction:	48.4 %
Usable Solar Gains:	8.699 Mil.BTU
Usable Solar Gains Fraction:	20.1 %
Auxiliary Energy Required:	11.746 Mil.BTU
Space Heating System Load:	11.746 Mil.BTU
Heat Pump and Furnace Annual COP:	1.404
Heat Pump Annual Energy Consumption:	1.775 Mil.BTU
Furnace/Boiler Annual Energy Consumption:	6.506 Mil.BTU
Annual Space Heating Energy Consumption:	8.281 Mil.BTU

---

### **DESIGN SPACE HEATING AND COOLING LOADS**

Design Heat Loss* at -40.0 °F (0.98 BTU/h / Ft3):	11842 BTU/h
Design Cooling Load* for July at (77.0 ° F ):	10590 BTU/h

\* Please refer to notes at the end of this report.

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### **ANNUAL SPACE COOLING SUMMARY**

Design Sensible Heat Ratio:	0.769
Estimated Annual Space Cooling Energy:	2296.04 kWh

Seasonal COP ( January to December): 3.799

### **BASE LOADS SUMMARY**

	kwh/day	Annual kWh
Interior Lighting	2.60	949.00
Appliances	6.30	2299.40
Other	9.70	3540.50
Exterior Use	0.90	328.50
<b>HVAC Fans</b>		
HRV/Exhaust	0.26	95.22
Space Heating	0.07	24.68
Space Cooling	1.11	406.77
<b>Total Average Electrical Load</b>	<b>20.94</b>	<b>7644.06</b>

### **FAN OPERATION SUMMARY (kWh)**

Hours	HRV/Exhaust Fans	Space Heating	Space Cooling
Heating	67.7	24.7	0.0
Neither	0.0	0.0	0.0
Cooling	27.6	0.0	406.8
<b>Total</b>	<b>95.2</b>	<b>24.7</b>	

---

**ENERGY CONSUMPTION SUMMARY REPORT**

Estimated Annual Space Heating Energy Consumption	= 8826.21 MJ	= 2451.72 kWh
Ventilator Electrical Consumption: Heating Hours	= 243.60 MJ	= 67.67 kWh
Estimated Annual DHW Heating Energy Consumption	= 16354.98 MJ	= 4543.05 kWh
<b>ESTIMATED ANNUAL SPACE + DHW ENERGY CONSUMPTION</b>	<b>= 25424.78 MJ</b>	<b>= 7062.44 kWh</b>
Estimated Greenhouse Gas Emissions	0.008 tonnes/year	

---

**ESTIMATED ANNUAL FUEL CONSUMPTION SUMMARY**

Fuel	Space Heating	Space Cooling	DHW Heating	Baseloads	Ventilation	Total
Electricity (kWh)	2519.4	2296.0	4543.0	7117.4	95.2	16503.4
PV generation applied to electrical consumption (kWh) :						13253.6
Net electrical consumption (kWh) :						3249.9

---

**ESTIMATED ANNUAL FUEL CONSUMPTION COSTS**

Fuel Costs Library = Embedded

RATE	Electricity (Ott 18)	Natural Gas (Ottawa18)	Oil (Ott 18)	Propane (Ott 18)	Wood (Ottc 18)	Total
\$	531.52	0.00	0.00	0.00	0.00	531.52

---

**Fuel Costs Library Listing**

Filename = Embedded

<b>Record # 1</b> Rate	Fuel: Electricity		
ID = Ott 18 Rate	Hydro Rate Block		
Block		Dollars	Charge
	kWhr	Per kWhr	(\$)
Minimum	0.0		10.000
1	1000.0	0.1200	
2	99999.0	0.1600	



**Record # 2**

Fuel: Natural Gas

Rate ID = Ottawa18

Gas Rate Block

Rate Block		Dollars	Charge
	m3	Per m3	(\$)
Minimum	0.0		20.000
1	30.0	0.2680	
2	55.0	0.2620	
3	170.0	0.2555	
4	99999.0	0.2540	

**Record # 3 Rate**

Fuel: Oil

ID = Ott 18 Rate

Oil Rate Block

Block		Dollars	Charge
	Litre	Per Litre	(\$)
Minimum	0.0		10.000
1	99999.0	1.1200	

**Record # 4 Rate**

Fuel: Propane

ID = Ott 18 Rate

Propane Rate Block

Block		Dollars	Charge
	Litre	Per Litre	(\$)
Minimum	0.0		0.000
1	99999.0	0.8600	

**Record # 5**

Fuel: Wood

Rate ID = Ottc 18

Cord Rate

Rate Block		Dollars	Charge
	Cord	Per Cord	(\$)
Minimum	0.0		0.000
1	7.0	300.0000	
2	99999.0	225.0000	

**MONTHLY ENERGY PROFILE**

Month	Energy Load (Mil.BTU)	Internal Gains (Mil.BTU)	Solar Gains (Mil.BTU)	Aux. Energy (Mil.BTU)	HRV Eff. %
Jan	6.628	2.140	1.290	3.197	66.5
Feb	5.585	1.985	1.384	2.216	69.8
Mar	5.065	2.256	1.450	1.359	76.7
Apr	3.547	2.183	0.968	0.397	82.1
May	2.567	2.032	0.527	0.008	82.1
Jun	1.257	1.114	0.144	0.000	81.0
Jul	0.764	0.739	0.026	0.000	83.2
Aug	0.924	0.874	0.050	0.000	83.2
Sep	1.713	1.367	0.346	0.000	83.0
Oct	3.016	2.061	0.692	0.262	83.1
Nov	4.210	2.051	0.813	1.346	80.3
Dec	6.088	2.118	1.011	2.960	70.0
Ann	41.365	20.920	8.699	11.746	78.2

**FOUNDATION ENERGY PROFILE**

Month	Heat Loss (Mil.BTU)		Basement	Walkout	Total
	Crawl Space	Slab			
Jan	0.000	0.000	0.000	0.000	0.000
Feb	0.000	0.000	0.000	0.000	0.000
Mar	0.000	0.000	0.000	0.000	0.000
Apr	0.000	0.000	0.000	0.000	0.000
May	0.000	0.000	0.000	0.000	0.000
Jun	0.000	0.000	0.000	0.000	0.000
Jul	0.000	0.000	0.000	0.000	0.000
Aug	0.000	0.000	0.000	0.000	0.000
Sep	0.000	0.000	0.000	0.000	0.000
Oct	0.000	0.000	0.000	0.000	0.000
Nov	0.000	0.000	0.000	0.000	0.000
Dec	0.000	0.000	0.000	0.000	0.000
Ann	0.000	0.000	0.000	0.000	0.000

**FOUNDATION TEMPERATURES & VENTILATION PROFILE**

Month	Temperature (Deg °F)			Air Change Rate		Heat Loss (Mil.BTU)
	Crawl Space	Basement	Walkout	Natural	Total	

Jan	0.0	63.2	0.0	0.014	0.121	1.526
Feb	0.0	63.4	0.0	0.012	0.119	1.221
Mar	0.0	63.9	0.0	0.009	0.117	0.971
Apr	0.0	64.6	0.0	0.006	0.113	0.561
May	0.0	65.3	0.0	0.003	0.111	0.336
Jun	0.0	66.1	0.0	0.002	0.109	0.180
Jul	0.0	67.0	0.0	0.001	0.108	0.086
Aug	0.0	66.7	0.0	0.001	0.109	0.120
Sep	0.0	65.7	0.0	0.003	0.110	0.275
Oct	0.0	65.0	0.0	0.005	0.112	0.450
Nov	0.0	64.2	0.0	0.008	0.115	0.751
Dec	0.0	63.4	0.0	0.012	0.119	1.342
Ann	0.0	64.9	0.0	0.006	0.114	7.819

### SPACE HEATING SYSTEM PERFORMANCE

Month	Space Heating Load (kWh)	Furnace Input (kWh)	Pilot Light (kWh)	Indoor Fans (kWh)	Heat Pump Input (kWh)	Total Input (kWh)	System Cop
Jan	937.0	683.7	0.0	9.4	78.9	771.9	1.214
Feb	649.6	410.9	0.0	5.2	78.2	494.3	1.314
Mar	398.4	160.7	0.0	1.7	84.4	246.8	1.614
Apr	116.3	2.6	0.0	-0.0	48.1	50.7	2.294
May	2.4	0.0	0.0	-0.0	18.5	18.5	0.128
Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.000
Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.000
Aug	0.0	0.0	0.0	0.0	0.0	0.0	0.000
Sep	0.0	0.0	0.0	0.0	0.0	0.0	0.000
Oct	76.9	0.1	0.0	-0.0	29.6	29.6	2.594
Nov	394.5	68.0	0.0	0.7	96.1	164.8	2.394
Dec	867.4	580.9	0.0	7.8	86.4	675.1	1.285
Ann	3442.4	1906.8	0.0	24.7	520.2	2451.7	1.404

### AIR CONDITIONING SYSTEM PERFORMANCE

Month	Sensible Load (Mil.BTU)	Latent Load (Mil.BTU)	AirCond Energy (kWh)	Fan Energy (kWh)	Ventilator Energy (kWh)	Crankcase Heater (kWh)	Total Energy (kWh)	COP	Av.RH %
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Jan	1.721	0.140	175.0	39.2	0.0	0.0	214.2	2.5	47.7
Feb	2.132	0.135	192.5	42.0	0.0	0.0	234.5	2.8	45.1
Mar	2.965	0.145	219.5	46.2	0.0	0.0	265.7	3.4	39.4
Apr	2.993	0.048	173.4	38.1	0.0	0.0	211.5	4.2	31.2
May	2.555	0.073	140.7	31.1	0.0	0.0	171.7	4.5	29.7
Jun	2.489	0.180	142.9	30.5	0.0	0.0	173.4	4.5	31.2
Jul	2.739	0.317	166.4	34.2	0.0	0.0	200.6	4.5	33.3
Aug	2.730	0.300	162.9	34.0	0.0	0.0	196.9	4.5	33.0
Sep	2.351	0.137	131.5	28.9	0.0	0.0	160.5	4.5	30.8
Oct	2.126	0.066	120.7	26.8	0.0	0.0	147.6	4.4	30.8
Nov	1.689	0.088	118.4	25.0	0.0	0.0	143.4	3.6	37.1
Dec	1.489	0.154	145.3	30.7	0.0	0.0	176.1	2.7	47.0
Ann	27.978	1.783	1889.3	406.8	0.0	0.0	2296.0	3.8	36.3

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**MONTHLY ESTIMATED ENERGY CONSUMPTION BY DEVICE (Mil.BTU)**

Month	Space Heating		DHW Heating		Lights & Appliances	HRV & FANS	Air Conditioner
	Primary	Secondary	Primary	Secondary			
Jan	0.269	2.333	1.350	0.000	2.063	0.200	0.597
Feb	0.267	1.402	1.230	0.000	1.863	0.191	0.657
Mar	0.288	0.548	1.361	0.000	2.063	0.192	0.749
Apr	0.164	0.009	1.317	0.000	1.996	0.155	0.592
May	0.063	0.000	1.348	0.000	2.063	0.131	0.480
Jun	0.000	0.000	1.276	0.000	1.996	0.128	0.487
Jul	0.000	0.000	1.290	0.000	2.063	0.142	0.568
Aug	0.000	0.000	1.268	0.000	2.063	0.141	0.556
Sep	0.000	0.000	1.220	0.000	1.996	0.123	0.449
Oct	0.101	0.000	1.269	0.000	2.063	0.117	0.412
Nov	0.328	0.232	1.250	0.000	1.996	0.113	0.404
Dec	0.295	1.982	1.321	0.000	2.063	0.164	0.496
Ann	1.775	6.506	15.502	0.000	24.286	1.797	6.446

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**ESTIMATED FUEL COSTS (Dollars)**

Month	Electricity	Natural Gas	Oil	Propane	Wood	Total
Jan	166.21	0.00	0.00	0.00	0.00	166.21
Feb	10.00	0.00	0.00	0.00	0.00	10.00
Mar	10.00	0.00	0.00	0.00	0.00	10.00
Apr	10.00	0.00	0.00	0.00	0.00	10.00

May	10.00	0.00	0.00	0.00	0.00	10.00
Jun	10.00	0.00	0.00	0.00	0.00	10.00
Jul	10.00	0.00	0.00	0.00	0.00	10.00
Aug	10.00	0.00	0.00	0.00	0.00	10.00
Sep	10.00	0.00	0.00	0.00	0.00	10.00
Oct	10.00	0.00	0.00	0.00	0.00	10.00
Nov	95.39	0.00	0.00	0.00	0.00	95.39
Dec	179.92	0.00	0.00	0.00	0.00	179.92
Ann	531.52	0.00	0.00	0.00	0.00	531.52

### PHOTOVOLTAIC SYSTEM MONTHLY PERFORMANCE : System -1-

Canadian  
Solar,  
HiKu 400  
watt  
modules

	Solar Radiation on	Air	Solar Radiation on	Average	Available
Month	Horizontal Surface	Temperature	Tilted Surface	Solar Power	Energy
	Btu/ft <sup>2</sup> /hr	°F	Btu/ft <sup>2</sup> /hr	Watts	kWh
Jan	14.35	-10.1	38.39	1089.7	770.2
Feb	28.21	-5.1	56.65	1699.3	1084.8
Mar	49.09	8.4	74.29	2279.9	1611.4
Apr	67.25	26.4	81.08	2457.2	1680.7
May	74.85	41.4	77.58	2274.8	1607.8
Jun	73.67	53.2	72.80	2051.9	1403.5
Jul	72.28	61.0	72.80	1982.5	1401.3
Aug	57.86	58.5	62.79	1728.1	1221.5
Sep	36.65	46.6	44.44	1257.9	860.4
Oct	20.69	34.5	30.54	850.2	601.0
Nov	12.25	16.5	25.32	687.9	470.6
Dec	9.98	-3.6	27.90	764.7	540.5
Annual	43.17	27.5	55.37	1592.6	13253.6

### \*\*\* DISTRIBUTION OF PHOTOVOLTAIC SYSTEM GENERATION (kWh) \*\*\*

Electrical	Available	PV	Net Electrical
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Month	Load	PV Energy	Utilized	Load
Jan	1996.5	770.2	770.2	1226.3
Feb	1644.0	1084.8	1644.0	0.0
Mar	1524.4	1611.4	1524.4	0.0
Apr	1240.4	1680.7	1240.4	0.0
May	1197.2	1607.8	1197.2	0.0
Jun	1139.5	1403.5	1139.5	0.0
Jul	1190.4	1401.3	1190.4	0.0
Aug	1180.5	1221.5	1180.5	0.0
Sep	1110.1	860.4	1110.1	0.0
Oct	1161.1	601.0	1161.1	0.0
Nov	1267.0	470.6	555.4	711.6
Dec	1852.5	540.5	540.5	1312.0
Annual	16503.4	13253.6	13253.6	3249.9

The calculated heat losses and energy consumptions are only estimates, based upon the data entered and assumptions within the program. Actual energy consumption and heat losses will be influenced by construction practices, localized weather, equipment characteristics and the lifestyle of the occupants.

Weather File - La Grande Riviere 8100 DD (weather map shows Chisasibi as 7700 DD, actual H2K La Grande Riviere location may be well inland from here), -39C Heating, 2C ground temp., 23C Cooling dry, 18.7C Cooling wet, 0.949214 Solar Index. 7.3m Elevation (Chisasibi) same as Eastmain

Weather File - Big Trout Lake 7650 DD, -40C Heating, 3C ground temp., 25C Cooling dry, 20C Cooling wet, 0.953604 Solar Index. 213m Elevation

Eastmain Weather Data 7129 DD by weather map, assumed -35C Heating, assumed 24C Cooling dry, 20C wet, 4C extrapolated ground temp. Solar Index by solar map is same as La Grande Riviere AND Big Trout Lake, 7.3m Elevation

Big Trout Lake will give us closest approximation for heat calculations, while we should toggle between La Grande Riviere and Big Trout Lake to ensure solar is correct. Kapuskasing, used for MoCreebec, would be too warm and sunny for Eastmain but a useful check on loads. Sioux Lookout will not work at all.

Interesting to see that [https://climateatlas.ca/map/canada/hdd\\_2060\\_85#z=6&lat=50.11&lng=-82.44&grid=328](https://climateatlas.ca/map/canada/hdd_2060_85#z=6&lat=50.11&lng=-82.44&grid=328) says that Eastmain Degree Days will go from 7129 now to 5344 by 2080 due to rapid climate change, and will be warmer than Ottawa by the end of this century. Of course everyone will be dead by then.

Floor joist / ICF detail to be supplied by Homesol, eliminate wood sillplate / header assembly, same R-value as crawl space wall (including the inside framed wall insulation). This is standard practice, anchor bolts are cast in the ICF – the way this is done is you actually screw the floor header to the ICF prior to pouring concrete, install the anchor bolts so they're held in place with the wood header, then tighten the nut/washer once the concrete dries, for extra support your interior wall can also hold the floor header in place, this is not rocket surgery.

Windows Duxton Cardinal 272 with 2 coats lowE, argon fill - R-7.69, U-overall 0.18, SHGC 0.35, VLT 0.58

Horizontal skirt simulated with 4" XPS against outside of foundation, same effect vertical as horizontal 5' skirt. Total height of foundation 5', includes "header", so this leaves 4' high access under floor, allows water heater to be installed here instead of upstairs in the bathroom. Recommend backfill should leave only 9" of foundation exposed after settling.

If footings are below frost depth then maybe no need for a skirt, there may be enough room in the model to eliminate it.

EASTMAIN ICF modeled entirely as "interior" assembly, same R-value. Sub-slab assumed R-24 (4" EPS). Don't be scammed by "radon insulation", sub-slab gravel bed is more than sufficient for radon venting.

Air leakage pegged at 0.6 ACH50 but 1.0 ACH50 is more realistic.

Mechanicals will go under the floor in the 4' high crawlspace (water heater, HRV), electrical needs to be in the main living area somewhere (inverter, main breakers) as the panel needs to be 40" off the floor.

Marathon 50 Gallon Short DHW (lifetime warranty, 0.96 EF) has a height of 47.25", 28" diameter, therefore the clear height of the crawl space is to be 4', plus 1' for "header"

Canadian Solar PV modules [https://www.canadiansolar.com/downloads/datasheets/na/hiku/CS-Flyer-HiKu\\_CS3W-P\\_HE\\_1000V\\_1500V\\_v5.561\\_E1\\_NA.pdf](https://www.canadiansolar.com/downloads/datasheets/na/hiku/CS-Flyer-HiKu_CS3W-P_HE_1000V_1500V_v5.561_E1_NA.pdf)

Increased roof slope to 8/12 in model from 6/12 on plans, still low at this latitude for best solar gain, it would be a bad idea to try and use racking to tilt the collectors rather than match the roof slope to best collector angle. Recommending 8/12 slope as best compromise between the design and the PV optimization. There is enough rooftop area on the south side to provide 100% of net annual consumption at this angle (34 degrees) if 700 SF of modules installed (total roof area available is 750 SF).

# HOMEOWNER INFORMATION SHEET

Your EnerGuide\* rating and this report are based on data collected and, where necessary, presumed from your evaluation. Rating calculations are made using standard operating conditions.



# ENERGUIDE

**Rating: 0** gigajoules per year (GJ/year)

Heated floor area: 188.0 m<sup>2</sup> (2023.6 ft<sup>2</sup>)

Rated energy intensity: 0.25 GJ/m<sup>2</sup>/year

Evaluated by: Ross Elliott

Quality assured by: Homesol Building Solutions Inc.

File number: 4G01P99999

Data collected: December 6, 2018

Year built: 2019

[NRCan.gc.ca/myenerguide](http://NRCan.gc.ca/myenerguide)

## HOW YOUR RATING IS CALCULATED:

- I. Rated annual energy consumption: 47 GJ/year  
 II. Minus renewable energy contribution: - 47 GJ/year  
 Equals your **EnerGuide rating**: = 0 GJ/year

I. Your rated annual energy consumption is the total amount of energy your house would use in a year based on the EnerGuide Rating System standard operating conditions. For your house, this includes 8.86 GJ of passive solar gain.

Energy Sources	Rated Consumption (GJ/year)	Equivalent Units (per year)	Greenhouse Gas Emissions (tonnes/year)
Electricity	47	13085 kWh	0.0
<b>Total</b>	<b>47</b>		<b>0.0</b>

II. On-site renewable power generation systems can offset some or even all of your home's energy consumption. Renewable energy contributions are factored differently for your rating and your greenhouse gas emissions calculations.<sup>1</sup>

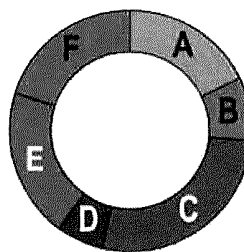
On-Site Renewable Energy	Estimated Contribution (GJ/year)	Equivalent Units (per year)	Offset Greenhouse Gas Emissions (tonnes/year)
Electricity	48	13254 kWh	0.0
Solar water heating	0	0	0.0
<b>Total</b>	<b>48</b>		<b>0.0</b>

## YOUR RATED GREENHOUSE GAS EMISSIONS CALCULATION:

Total greenhouse gas emissions: 0.0 tonnes/year  
 Minus emissions offset by on-site renewables: - 0.0 tonnes/year  
 Equals your **rated greenhouse gas emissions**: = 0.0 tonnes/year

## HOW YOUR RATED ENERGY IS USED:

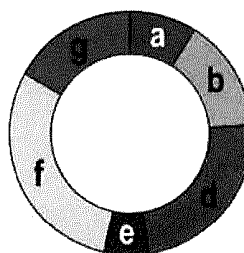
The chart below represents the breakdown of rated annual energy consumption in your home under standard operating conditions. You can use these figures as a guide to help identify where you can lower home energy costs through proper home maintenance, efficient home operation, energy efficiency renovations or equipment replacement.



- A. Space heating 17%
- B. Space cooling 8%
- C. Water heating 26%
- D. Ventilation 1%
- E. Lights & appliances 19%
- F. Other electrical 29%

## WHERE YOUR HOME LOSES HEAT:

Houses lose heat through their exterior shell, or building envelope. The chart below shows where and how your home loses heat. The quality and upkeep of your home can have a major impact on the amount of energy your heating and cooling systems use annually.



- a. Attic/Ceiling 9%
- b. Main Walls 15%
- c. Exposed floors 0%
- d. Windows 24%
- e. Exterior doors 5%
- f. Basement/Foundation 30%
- g. Air leakage/ventilation 17%

\*EnerGuide is an official mark of Natural Resources Canada. Refer to the glossary section for an explanation of relevant terms.



## HOUSE DETAILS

## BUILDING ENVELOPE

## ATTIC/CEILING

TYPE	INSULATION VALUE		AREA m <sup>2</sup> (ft <sup>2</sup> )
	Nominal RSI (R)	Effective RSI (R)	
Ceiling - 1: Attic/gable	14.14 (80.3)	14.21 (80.7)	94 (1012)

## MAIN WALLS

TYPE	INSULATION VALUE		AREA m <sup>2</sup> (ft <sup>2</sup> )
	Nominal RSI (R)	Effective RSI (R)	
Wall - BUFFERED	8.57 (48.6)	8.32 (47.3)	17.5 (189)
Wall - 1	8.57 (48.6)	8.39 (47.6)	81.3 (875)

## WINDOWS

#	TYPE	U-factor W/m <sup>2</sup> • °C (Btu/h • ft <sup>2</sup> • °F)	RSI (R)
2	Window - C	1.3 (0)	0.77 (4.4)
6	Window - A	1.1 (0)	0.88 (5.0)
1	Window - B	1 (0)	1.00 (5.7)
1	Window - 1	0.9 (0)	1.05 (6.0)
Total window area: 12.9 m <sup>2</sup> (138.9 ft <sup>2</sup> )			

## EXTERIOR DOORS

#	TYPE	U-factor W/m <sup>2</sup> • °C (Btu/h • ft <sup>2</sup> • °F)	RSI (R)
2	Fibreglass medium density spray foam core	1 (0)	0.98 (5.6)
Total door area: 4 m <sup>2</sup> (43 ft <sup>2</sup> )			

## BASEMENT/FOUNDATION

TYPE	INSULATION VALUE		AREA m <sup>2</sup> (ft <sup>2</sup> )
	Nominal RSI (R)	Effective RSI (R)	
Basement - 2 concrete walls: exterior	N/A	N/A	61.8 (665)
Basement - 2 concrete walls: interior	10.62 (60.3)	10.43 (59.0)	61.8 (665)
Basement - 2 slab	4.23 (24.0)	4.23 (24.0)	94 (1012)

## AIRTIGHTNESS

Air leakage rate at 50 pascals	0.6 air changes / hour
Equivalent leakage area	76.8 cm <sup>2</sup> (12 in <sup>2</sup> )
Normalized leakage area	0.2 cm <sup>2</sup> / m <sup>2</sup> (0.3 in <sup>2</sup> / 100 ft <sup>2</sup> )

## MECHANICAL SYSTEMS

## SPACE HEATING

TYPE	OUTPUT SIZE	EFFICIENCY
Electric baseboard	3.5 kW 12000 BTU/h	100% Steady State
Mini-split air-source heat pump	7 kW 24000 BTU/h	14HSPF
Design heating load: 3.47 kW		

## SPACE COOLING

TYPE	OUTPUT SIZE	EFFICIENCY
Mini-split air-source heat pump	7 kW 24000 BTU/h	33 SEER
Design cooling load: 3.1 kW		

## WATER HEATING

TYPE	TANK VOLUME	EFFICIENCY
Electric storage tank	189L (50 USG)	0.96 EF

## WHOLE-HOME VENTILATION

TYPE	AIR FLOW RATE	EFFICIENCY
Home Ventilating Institute listed ENERGY STAR certified heat recovery ventilator	44.98 L/s (95 cfm)	84%

## HEATED FLOOR AREA

Above-grade area	94 m <sup>2</sup> (1011.8 ft <sup>2</sup> )
Below-grade area	94 m <sup>2</sup> (1012 ft <sup>2</sup> )

## RENEWABLE ENERGY READINESS

Your home has been designed to meet CanmetENERGY's Solar Ready Guidelines. This means it has been designed to easily accommodate a solar energy system. For details on the Solar Ready Guidelines, please visit <http://www.nrcan.gc.ca/energy/efficiency/housing/research/5141>

## REDUCED USE ASSUMPTIONS

Your EnerGuide Rating includes reductions to the Standardized Occupant and Use Assumptions defined in the glossary.

## Hot water use savings of 31.36 L/day

Your house is equipped with the following hot water saving fixtures and/or equipment:

Low-flow showerheads  
Low-flow bathroom faucets  
ENERGY STAR Clothes washer  
ENERGY STAR Dishwasher

## Lighting Savings of 2.0kWh/day

Your house qualifies for the high-efficiency lighting package as more than 75% of fixtures are equipped with CFLs or LEDs

## GLOSSARY

**Airtightness**

describes how well the building envelope resists air leakage and is measured in air changes per hour at 50 pascals (ACH@50 Pa). The fewer air changes per hour, the more airtight the building envelope is. Equivalent leakage area is another way of describing the airtightness of the building envelope. It represents the size of a single hole in your building envelope if all the individual air leakage holes or gaps were added together. The smaller the equivalent leakage area, the less energy you will need to control the temperature of your home (but you will still need to ensure that you have adequate ventilation).

**Design heating/cooling loads**

provide an estimate of the capacity of the heating and cooling equipment needed to maintain your home at 22 °C in the winter and 24 °C in the summer and are provided for guidance only. Before having a new heating/cooling system installed, your heating/cooling contractor should perform an independent, detailed heat loss/heat gain calculation on your home in order to select the appropriate equipment.

**Gigajoule (GJ)**

is a unit of energy. It can be used as a measure of any type of energy that is consumed or produced in your home. Specifically, one GJ is the equivalent of 278 kWh of electricity, 27m³ of natural gas, 26 L of oil, 39 L of propane, or 947 817 BTUs. One GJ is roughly equal to the energy from two standard barbeque propane tanks or 30 litres of gas in a car's gas tank.

**Greenhouse gas emissions**

are the amounts of carbon dioxide, methane and nitrous oxide that are produced directly, by burning fossil and solid fuels, or indirectly, through the production of electricity. Greenhouse gas emissions are expressed in carbon dioxide equivalent units. Greenhouse gas emissions are calculated by multiplying the quantity of fuel or electricity used in your home by the emission factors for the particular energy source. Electricity factors vary by province because there are different emissions associated with each province's method of producing electricity. One tonne of greenhouse gas emissions is equivalent to the CO<sub>2</sub> emissions produced by driving an average efficiency mid-size vehicle from Toronto to Vancouver.

**Heated floor area**

represents the total useable area of your home that is heated, measured at the interior of the outer walls or of the walls attached to other buildings.

**Insulation values**

Are expressed in RSI (m² · °C/W) or R-value (h · ft² · °F/Btu) and represent the resistance to the flow of heat of a given thickness of insulation or construction assembly. The higher the RSI-value (R-value), the better the performance. The nominal value represents the resistance to the flow of heat of just the insulation while the effective value represents the resistance to the flow of heat of the entire wall, ceiling or floor assembly considering the structure, insulation, framing, sheathing and all finishing.

**On-site renewable energy contributions**

are subtracted from the rated annual energy consumption to

calculate the EnerGuide rating. For the calculation of the rated greenhouse gas emissions, on-site electricity generation only offsets emissions associated with electricity consumption, whereas a solar water heater reduces the emissions that would have been produced from the source of energy used to heat water.

**Passive solar gain**

is the heat from the sun that influences your home's heating and cooling requirements. Generally, south facing windows provide more solar gain.

**Rated energy intensity**

is calculated by dividing your rated annual energy consumption by your home's heated floor area. It allows you to compare the annual energy use of homes of different sizes on a "per square metre" basis.

**Standard operating conditions**

have been used to calculate your home's EnerGuide Rating. The rating assumes a standard number of occupants and energy use patterns. This allows for comparison of energy use across houses so that the house is rated and not the operation of the house by the occupants. The values are:

- Two adults and one child, at home 50% of the time;
- Hot water use of 178 - 199 L/day, variable depending on incoming ground water temperature;
- Thermostat settings of 21°C for daytime heating, 18°C for nighttime heating and 25°C for cooling; and
- Lighting, appliance and other electrical loads of 19.5 kWh/day.

**U-factor**

measures heat transferred through windows and doors, expressed in W/m² · °C (BTU/h · ft² · °F). The lower the U-factor, the better the energy efficiency of a window. The inverse of U-factor (1/U-factor) identifies the resistance to the flow of heat, expressed in RSI. The higher the RSI, the better the window is at resisting heat loss. You can use these values to choose more energy efficient windows.

For more details and additional terms, please visit [NRCan.gc.ca/myenergiguide](http://NRCan.gc.ca/myenergiguide).

123 Anystreet,  
Eastmain, QUEBEC, J0M0B3

# ENERGUIDE

Data collected: December 6, 2018

File number: 4G01P99999

Evaluated by: Ross Elliott

▼0 \*This house produces more energy than it uses on an annual basis  
GJ/year



▲0 GJ/year  
Best energy performance

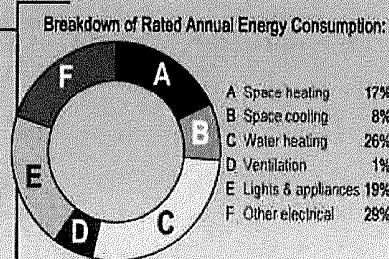
▲94 GJ/year  
A typical new house

Uses most energy

One gigajoule (GJ) equals the energy from two BBQ propane tanks

<b>Rated Annual Energy Consumption</b>	<b>47 GJ</b>
• Electricity	47
<b>On-site renewable energy contributions</b>	<b>-47 GJ</b>
• Electricity	48
• Solar water heating	0
<b>EnerGuide Rating:</b>	<b>= 0 GJ</b>

Figures may not add up due to rounding.

Rated Energy Intensity: 0.25 GJ/m<sup>2</sup>/year

Rated Greenhouse Gas Emissions: 0.0 tonnes/year

The energy consumption indicated on your utility bills may be higher or lower than your EnerGuide rating. This is because standard assumptions have been made regarding how many people live in your house and how the home is operated. Your rating is based on the condition of your house on the day it was evaluated.

Quality assured by: Homesol Building Solutions Inc.

Visit [NRCan.gc.ca/myenerguide](http://NRCan.gc.ca/myenerguide)Natural Resources  
CanadaRessources naturelles  
Canada

Canada

## NEXT STEPS

If you have had a Renovation Upgrade Service, refer to your report for the roadmap to making your home more energy efficient. If you have not yet had a Renovation Upgrade Service, why not contact your service organization to learn what you can do to save on energy costs, reduce greenhouse gas emissions and improve home comfort?

Everyone uses energy in their house differently. This report was developed using standard operating conditions as explained in the glossary. Therefore, your EnerGuide rating will not match your utility bills.

## UPGRADE CONSIDERATIONS

Before undertaking upgrades or renovations, find out about appropriate products and installation techniques, and ensure that all renovations meet local building codes and by-laws. Natural Resources Canada does not endorse the services of any contractor, nor any specific product, and accepts no liability in the selection of materials, products, contractors nor performance of workmanship.

Where your energy advisor has identified a potential health or safety concern such as insufficient outdoor air, risk of combustion fumes entering your house or risk of exposure to asbestos, they have endeavoured to provide a warning in this report. However, energy advisors are not required to have expertise in health and safety matters, and homeowners are solely responsible for consulting a qualified professional to determine potential hazards before undertaking any upgrades or renovations.

Visit us today at:

[NRCan.gc.ca/myenerguide](http://NRCan.gc.ca/myenerguide)

# **HOT2000**

Natural Resources CANADA  
Version v11.5



**File:** Sixplex1 FINAL  
Multi-unit: whole building

**Weather Library:** C:\HOT2000 v11.5b8\Dat\Wth110.dir  
**Weather Data for:** BIG TROUT LAKE, ONTARIO

**Builder Code:** 4G01P99998

**Data Entry by:** Ross Elliott  
**Date of entry:** 2018-12-06

**Company:** Homesol Building Solutions Inc.

**Client name:** Sixplex, Eastmain

**Street address:** 123 Anystreet

**City:** Eastmain

**Postal code:** J0M0B3

**Region:** QUEBEC

**Telephone:**

**Mailing address:** 123 Anystreet

**City:** Eastmain

**Postal Code:** J0M0B3

**Region:** QUEBEC

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## **GENERAL HOUSE CHARACTERISTICS**

**House type:** N/A

**Number of storeys:** Two storeys

**Plan shape:**

**Front orientation:** South

**Year House Built:** 2019

**Wall colour:** Default

**Absorptivity:** 0.40

**Roof colour:** Default

**Absorptivity:** 0.40

**Soil Condition:** Normal conductivity (dry sand, loam, clay)

**Water Table Level:** Normal (7-10m/23-33ft)

**House Thermal Mass Level:** (A) Light, wood frame

**Effective mass fraction** 1.000

**Occupants :** 12 Adults for 50.0% of the time  
0 Children for 50.0% of the time

0 Infants for 0.0% of the time

**Sensible Internal Heat  
Gain From Occupants:**

9.60 kWh/day

## HOUSE TEMPERATURES

### Heating Temperatures

Main Floor	Daytime Setpoint:	21.0 °C
	Nighttime Setpoint:	18.0 °C
	Nighttime Setback Duration:	8.0 Hours
	24 Hour Average:	20.0 °C
	Setpoint:	19.0 °C
Basement	TEMP. Rise from 20.0 °C:	5.5 °C

Cooling Temperature: Main Floor : 25.00 °C

Basement is- Heated:No Cooled: No Separate T/S: Yes

Fraction of internal gains released in basement : 0.150

### Indoor design temperatures for equipment sizing

Heating:	22.0 °C
Cooling:	24.0 °C

## WINDOW CHARACTERISTICS

Label	Location	#	Overhang Width (m)	Header Height (m)	Tilt deg	Curtain Factor	Shutter (RSI)
<b>South</b>							
Window - A	Wall - lower2	5	0.00	0.00	90.0	1.00	0.00
Window - A	Wall - lower1	5	0.00	0.00	90.0	1.00	0.00
Window - B	Wall - lower1	2	0.00	0.00	90.0	1.00	0.00
Window - B	Wall - lower2	2	0.00	0.00	90.0	1.00	0.00
Window - C	Wall - upper	2	0.00	0.00	90.0	1.00	0.00
Window - D	Wall - upper	7	0.00	0.00	90.0	1.00	0.00
Window - D	Wall - upper	7	0.00	0.00	90.0	1.00	0.00
<b>Southeast</b>							
Window - A	Wall - lower1	1	0.00	0.00	90.0	1.00	0.00
<b>East</b>							
Window - 5	Door - H	1	0.00	0.00	90.0	1.00	0.00
Window - 5	Door - H	1	0.00	0.00	90.0	1.00	0.00
Window - D	Wall - upper	1	0.00	0.00	90.0	1.00	0.00

<b>Window - F</b>	Wall - lower1	1	0.00	0.00	90.0	1.00	0.00
<b>Northeast</b>							
<b>Window - E</b>	Wall - lower1	1	0.00	0.00	90.0	1.00	0.00
<b>North</b>							
<b>Window - D</b>	Wall - lower2	3	0.00	0.00	90.0	1.00	0.00
<b>Window - D</b>	Wall - lower1	3	0.00	0.00	90.0	1.00	0.00
<b>Window - E</b>	Wall - upper	9	0.00	0.00	90.0	1.00	0.00
<b>Window - E</b>	Wall - upper	9	0.00	0.00	90.0	1.00	0.00
<b>Window - F</b>	Wall - lower2	1	0.00	0.00	90.0	1.00	0.00
<b>Window - F</b>	Wall - upper	2	0.00	0.00	90.0	1.00	0.00
<b>Window - F</b>	Wall - lower1	1	0.00	0.00	90.0	1.00	0.00
<b>Northwest</b>							
<b>Window - E</b>	Wall - lower2	1	0.00	0.00	90.0	1.00	0.00
<b>West</b>							
<b>Window - 5</b>	Door - H	1	0.00	0.00	90.0	1.00	0.00
<b>Window - 5</b>	Door - H	1	0.00	0.00	90.0	1.00	0.00
<b>Window - D</b>	Wall - upper	1	0.00	0.00	90.0	1.00	0.00
<b>Window - F</b>	Wall - lower2	1	0.00	0.00	90.0	1.00	0.00
<b>Southwest</b>							
<b>Window - A</b>	Wall - lower2	1	0.00	0.00	90.0	1.00	0.00

<b>Label</b>	<b>Type</b>	<b>#</b>	<b>Window Width (m)</b>	<b>Window Height (m)</b>	<b>Total Area (m<sup>2</sup>)</b>	<b>Window RSI</b>	<b>SHGC</b>	<b>ER*</b>
<b>South</b>								
<b>Window - A</b>	EASTMAIN DUX	5	1.52	1.52	11.61	1.011	0.3937	41.0
<b>Window - A</b>	EASTMAIN DUX	5	1.52	1.52	11.61	1.011	0.3937	41.0
<b>Window - B</b>	EASTMAIN DUX	2	2.29	1.52	6.97	1.018	0.4031	41.6
<b>Window - B</b>	EASTMAIN DUX	2	2.29	1.52	6.97	1.018	0.4031	41.6
<b>Window - C</b>	EASTMAIN DUX	2	1.52	1.22	3.72	1.005	0.3867	40.3

<b>Window - D</b>	EASTMAIN DUX	7	0.76	1.22	6.50	0.985	0.3591	38.4
<b>Window - D</b>	EASTMAIN DUX	7	0.76	1.22	6.50	0.985	0.3591	38.4
<b>Southeast</b>								
<b>Window - A</b>	EASTMAIN DUX	1	1.52	1.52	2.32	1.011	0.3937	40.6
<b>East</b>								
<b>Window - 5</b>	EASTMAIN DUX	1	0.51	1.73	0.88	0.971	0.3403	36.0
<b>Window - 5</b>	EASTMAIN DUX	1	0.51	1.73	0.88	0.971	0.3403	36.0
<b>Window - D</b>	EASTMAIN DUX	1	0.76	1.22	0.93	0.985	0.3591	37.5
<b>Window - F</b>	EASTMAIN DUX	1	0.61	1.07	0.65	0.973	0.3408	35.7
<b>Northeast</b>								
<b>Window - E</b>	EASTMAIN DUX	1	0.76	1.07	0.81	0.982	0.3544	37.0
<b>North</b>								
<b>Window - D</b>	EASTMAIN DUX	3	0.76	1.22	2.79	0.985	0.3591	38.2
<b>Window - D</b>	EASTMAIN DUX	3	0.76	1.22	2.79	0.985	0.3591	38.2
<b>Window - E</b>	EASTMAIN DUX	9	0.76	1.07	7.32	0.982	0.3544	38.0
<b>Window - E</b>	EASTMAIN DUX	9	0.76	1.07	7.32	0.982	0.3544	38.0
<b>Window - F</b>	EASTMAIN DUX	1	0.61	1.07	0.65	0.973	0.3408	35.7
<b>Window - F</b>	EASTMAIN DUX	2	0.61	1.07	1.30	0.973	0.3408	36.4
<b>Window - F</b>	EASTMAIN DUX	1	0.61	1.07	0.65	0.973	0.3408	35.7
<b>Northwest</b>								
<b>Window - E</b>	EASTMAIN DUX	1	0.76	1.07	0.81	0.982	0.3544	37.0
<b>West</b>								
<b>Window - 5</b>	EASTMAIN DUX	1	0.51	1.73	0.88	0.971	0.3403	36.0
<b>Window - 5</b>	EASTMAIN DUX	1	0.51	1.73	0.88	0.971	0.3403	36.0
<b>Window - D</b>	EASTMAIN DUX	1	0.76	1.22	0.93	0.985	0.3591	37.5
<b>Window - F</b>	EASTMAIN DUX	1	0.61	1.07	0.65	0.973	0.3408	35.7
<b>Southwest</b>								
<b>Window - A</b>	EASTMAIN DUX	1	1.52	1.52	2.32	1.011	0.3937	40.6



\*ER Window Energy Rating (ER 2009) estimated for actual dimensions, and Air tightness type: CSA - A3;  
Leakage rate = 0.50 L/s.m<sup>2</sup>

Above grade fraction of wall area occupied by windows: 18.6 %

\*\*\* TYPE 2 USER DEFINED WINDOW CODES \*\*\*

Code Label	Description	Glazing Type	Fill Gas	Thermal Resistance	SHGC	Window Style	Low -E Coating	Frame Height
EASTMAIN DUX	cardinal 272, 2 coats, argon R-7.69, U-overall 0.18, SHGC 0.35,	TG with 2 coatings	Argon	0.9784 RSI	0.3500	Casement	Hard Coat	50.80
EASTMAIN DUX	cardinal 272, 2 coats, argon R-7.69, U-overall 0.18, SHGC 0.35,	TG with 2 coatings	Argon	0.9784 RSI	0.3500	Casement	Hard Coat	50.80
EASTMAIN DUX	cardinal 272, 2 coats, argon R-7.69, U-overall 0.18, SHGC 0.35,	TG with 2 coatings	Argon	0.9784 RSI	0.3500	Casement	Hard Coat	50.80
EASTMAIN DUX	cardinal 272, 2 coats, argon R-7.69, U-overall 0.18, SHGC 0.35,	TG with 2 coatings	Argon	0.9784 RSI	0.3500	Casement	Hard Coat	50.80
EASTMAIN DUX	cardinal 272, 2 coats, argon R-7.69, U-overall 0.18, SHGC 0.35,	TG with 2 coatings	Argon	0.9784 RSI	0.3500	Casement	Hard Coat	50.80
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EASTMAIN DUX	cardinal 272, 2 coats, argon R-7.69, U-overall 0.18, SHGC 0.35,	TG with 2 coatings	Argon	0.9784 RSI	0.3500	Casement	Hard Coat	50.80
EASTMAIN DUX	cardinal 272, 2 coats, argon R-7.69, U-overall 0.18, SHGC 0.35,	TG with 2 coatings	Argon	0.9784 RSI	0.3500	Casement	Hard Coat	50.80
EASTMAIN DUX	cardinal 272, 2 coats, argon R-7.69, U-overall 0.18, SHGC 0.35,	TG with 2 coatings	Argon	0.9784 RSI	0.3500	Casement	Hard Coat	50.80
EASTMAIN DUX	cardinal 272, 2 coats, argon R-7.69, U-overall 0.18, SHGC 0.35,	TG with 2 coatings	Argon	0.9784 RSI	0.3500	Casement	Hard Coat	50.80

DUX	coats, argon R-7.69, U-overall 0.18, SHGC 0.35,	coatings		RSI		Coat	
EASTMAIN DUX	cardinal 272, 2 coats, argon R-7.69, U-overall 0.18, SHGC 0.35,	TG with 2 coatings	Argon	0.9784 RSI	0.3500	Casement Hard Coat	50.80
EASTMAIN DUX	cardinal 272, 2 coats, argon R-7.69, U-overall 0.18, SHGC 0.35,	TG with 2 coatings	Argon	0.9784 RSI	0.3500	Casement Hard Coat	50.80
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EASTMAIN DUX	cardinal 272, 2 coats, argon R-7.69, U-overall 0.18, SHGC 0.35,	TG with 2 coatings	Argon	0.9784 RSI	0.3500	Casement Hard Coat	50.80

EASTMAIN DUX	cardinal 272, 2 coats, argon R-7.69, U-overall 0.18, SHGC 0.35,	TG with 2 coatings	Argon	0.9784 RSI	0.3500	Casement	Hard Coat	50.80
EASTMAIN DUX	cardinal 272, 2 coats, argon R-7.69, U-overall 0.18, SHGC 0.35,	TG with 2 coatings	Argon	0.9784 RSI	0.3500	Casement	Hard Coat	50.80

## BUILDING PARAMETER DETAILS

### CEILING COMPONENTS

	Construction Type	Code Type	Roof Slope	Heel Ht. (m)	Section Area (m <sup>2</sup> )	R. Value (RSI)
Ceiling - lower	Attic/gable	EASTMAIN R80	3.996/12	0.61	156.40	14.21
Ceiling - upper1	Attic/gable	EASTMAIN R80	12.000/12	0.61	188.29	14.21
Ceiling - upper2	Attic/gable	EASTMAIN R80	12.000/12	0.61	188.29	14.21

### MAIN WALL COMPONENTS

Label	Lintel Type	Fac. Dir	Number of Corn.	Number of Inter.	Height (m)	Perim. (m)	Area (m <sup>2</sup> )	R. Value (RSI)
Wall - BUFFERED Type: EASTMAIN DBLSTUD	N/A	N/A	2	3	2.44	29.72	72.46	> 9.53
Wall - lower1 Type: EASTMAIN DBLSTUD	N/A	N/A	2	6	2.44	38.13	92.98	9.41
Wall - lower2 Type: EASTMAIN DBLSTUD	N/A	N/A	2	6	2.44	38.13	92.98	9.41
Wall - upper Type: EASTMAIN DBLSTUD	N/A	N/A	6	12	2.74	72.18	197.99	9.65

> Indicates that the component is adjacent to an enclosed unconditioned space.

### DOORS

Label	Type	Height (m)	Width (m)	Gross Area (m <sup>2</sup> )	R. Value (RSI)
Door - G Loc: Wall - BUFFERED	Fibreglass Medium density spray foam core	2.08	0.97	2.01	> 1.14

Door - G copy Loc: Wall - BUFFERED	Fibreglass Medium density spray foam core	2.08	0.97	2.01	> 1.14
Door - G copy Loc: Wall - BUFFERED	Fibreglass Medium density spray foam core	2.08	0.97	2.01	> 1.14
Door - G copy Loc: Wall - BUFFERED	Fibreglass Medium density spray foam core	2.08	0.97	2.01	> 1.14
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Door - G copy Loc: Wall - BUFFERED	Fibreglass Medium density spray foam core	2.08	0.97	2.01	> 1.14
Door - G copy Loc: Wall - BUFFERED	Fibreglass Medium density spray foam core	2.08	0.97	2.01	> 1.14
Door - G copy Loc: Wall - BUFFERED	Fibreglass Medium density spray foam core	2.08	0.97	2.01	> 1.14
Door - H Loc: Wall - lower1	Fibreglass Medium density spray foam core	2.13	0.81	1.73	0.98
Door - H Loc: Wall - lower2	Fibreglass Medium density spray foam core	2.13	0.81	1.73	0.98
Door - H Loc: Wall - lower2	Fibreglass Medium density spray foam core	2.13	0.81	1.73	0.98
Door - H Loc: Wall - lower1	Fibreglass Medium density spray foam core	2.13	0.81	1.73	0.98

> Indicates that the component is adjacent to an enclosed unconditioned space.

#### USER-DEFINED STRUCTURE CODES SCHEDULE

Name	Description
11EASTMAIN DBLSTUD	New code description
21EASTMAIN R80	New code description
@EASTMAIN ICF R22	New code description

## FOUNDATIONS

Foundation Name: Basement - 1  
 Foundation Type: Basement  
 Data Type: Library

Volume: 221.6 m<sup>3</sup>  
 Opening to Main Floor: 0.00 m<sup>2</sup>

Total Wall Height: 1.16 m  
 Depth Below Grade: 0.94 m

Non-Rectangular  
 Floor Perimeter: 67.06 m  
 Floor Area: 191.31 m<sup>2</sup>

Interior wall type: EASTMAIN ICF R22  
 Exterior wall type: User specified  
 Number of corners : 1  
 Lintel type: N/A  
 Added to slab type : N/A  
 Floors Above 4231006600  
 Found.:

R-value: 11.40 RSI  
 R-Value: 4.23 RSI  
  
 R-Value: 4.23 RSI  
 R-Value: 0.71 RSI

Exposed areas for: Basement - 1  
 Exposed Perimeter: 57.79 m

Configuration: BCCB\_4  
 - concrete walls and floor  
 - interior surface of wall insulated over full-height  
 - exterior surface of wall insulated over full-height  
 - sub-surface of floor slab fully insulated but no insulation under footings  
 - thermal-break between walls and floor slab  
 - any first storey construction type

Foundation Name: Basement - 2  
 Foundation Type: Basement  
 Data Type: Library

Volume: 221.6 m<sup>3</sup>  
 Opening to Main Floor: 0.00 m<sup>2</sup>

Total Wall Height: 1.16 m  
 Depth Below Grade: 0.94 m

Non-Rectangular  
 Floor Perimeter: 67.06 m  
 Floor Area: 191.31 m<sup>2</sup>

Interior wall type: EASTMAIN ICF R22  
 Exterior wall type: User specified  
 Number of corners : 1  
 Lintel type: N/A  
 Added to slab type : N/A  
 Floors Above 4231006600  
 Found.:

R-value: 11.40 RSI  
 R-Value: 4.23 RSI  
  
 R-Value: 4.23 RSI  
 R-Value: 0.71 RSI

Exposed areas for: Basement - 2  
 Exposed Perimeter: 57.79 m

Configuration: BCCB\_4  
 - concrete walls and floor  
 - interior surface of wall insulated over full-height  
 - exterior surface of wall insulated over full-height  
 - sub-surface of floor slab fully insulated but no insulation under footings

- thermal-break between walls and floor slab
- any first storey construction type

## FOUNDATION CODE SCHEDULE

### Interior Wall

Name	Code	Description (Fram., Spac., Studs, Ins/fram., Xtra ins, Int)
EASTMAIN ICF R22	@EASTMAIN ICF R22	N/A, N/A, N/A, Expanded Polystyrene(EPS II), 76 mm (3 in) EPS I, N/A, N/A, N/A, N/A

### Floors Above Foundation

Name	Internal Code	Description (Structure, typ/size, Spacing, Insul1, 2, Int., Sheathing, Exterior, Drop Framing)
4231006600	4231006600	Wood frame, 38x235 mm (2x10 in), 400 mm (16 in), None, None, Wood, Plywood/Particle board 15.5 mm (5/8 in), None, No

## ROOF CAVITY INPUTS

<b>Gable Ends</b>		<b>Total Area:</b>	142.89 m <sup>2</sup>
<b>Sheathing Material</b>	Plywood/Part. bd 9.5 mm (3/8 in)		0.08 RSI
<b>Exterior Material:</b>	Hollow metal/vinyl cladding		0.11 RSI
<b>Sloped Roof</b>		<b>Total Area:</b>	697.40 m <sup>2</sup>
<b>Sheathing Material</b>	Plywood/Part. bd 12.7 mm (1/2 in)		0.11 RSI
<b>Exterior Material:</b>	Asphalt shingles		0.08 RSI
<b>Total Cavity Volume:</b>	1187.7 m <sup>3</sup>	<b>Ventilation Rate:</b>	0.50 ACH/hr

**BUILDING ASSEMBLY DETAILS**

Label	Construction Code	Nominal (RSI)	System (RSI)	Effective (RSI)
<b>CEILING COMPONENTS</b>				
Ceiling - lower	EASTMAIN R80	14.14	14.21	14.21
Ceiling - upper1	EASTMAIN R80	14.14	14.21	14.21
Ceiling - upper2	EASTMAIN R80	14.14	14.21	14.21
<b>MAIN WALL COMPONENTS</b>				
Wall - BUFFERED	EASTMAIN DBLSTUD	10.17	9.37	9.37
Wall - lower1	EASTMAIN DBLSTUD	10.17	9.41	9.41
Wall - lower2	EASTMAIN DBLSTUD	10.17	9.41	9.41
Wall - upper	EASTMAIN DBLSTUD	10.17	9.65	9.65
<b>FLOORS ABOVE BASEMENTS</b>				
Basement - 1	4231006600	0.00	0.71	0.71
Basement - 2	4231006600	0.00	0.71	0.71

**BUILDING PARAMETERS SUMMARY****ZONE 1 : Above Grade**

Component	Area m <sup>2</sup> Gross	Area m <sup>2</sup> Net	Effective (RSI)	Heat Loss MJ	% Annual Heat Loss
Ceiling	532.98	532.98	14.21	24619.62	12.53
Main Walls	456.41	339.23	9.54	24077.49	12.25
Doors	31.06	27.55	0.98	20034.79	10.19
South Windows	53.88	53.88	1.01	38179.21	19.43
Southeast Windows	2.32	2.32	1.01	1637.96	0.83
East Windows	3.33	3.33	0.98	2436.06	1.24
Northeast Windows	0.81	0.81	0.98	589.69	0.30
North Windows	22.81	22.81	0.98	16550.78	8.42
Northwest Windows	0.81	0.81	0.98	589.69	0.30
West Windows	3.33	3.33	0.98	2436.06	1.24
Southwest Windows	2.32	2.32	1.01	1637.96	0.83
<b>ZONE 1 Totals:</b>				<b>132789.33</b>	<b>67.56</b>

**INTER-ZONE Heat Transfer : Floors Above Basement**

Area m <sup>2</sup> Gross	Area m <sup>2</sup> Net	Effective (RSI)	Heat Loss MJ
382.61	382.61	0.706	27241.23

**ZONE 2 : Basement**

<b>Component</b>	<b>Area m<sup>2</sup> Gross</b>	<b>Area m<sup>2</sup> Net</b>	<b>Effective (RSI)</b>	<b>Heat Loss MJ</b>	<b>% Annual Heat Loss</b>
Walls above grade	24.65	24.65	-	6246.55	3.18
Below grade foundation	491.82	491.82	-	23104.09	11.76
<b>ZONE 2 Totals:</b>				<b>29350.64</b>	<b>14.93</b>

**Air Leakage and Mechanical Ventilation**

<b>House Volume</b>	<b>Air Change</b>	<b>Heat Loss MJ</b>	<b>% Annual Heat Loss</b>
2565.64 m <sup>3</sup>	0.050 ACH	34403.020	17.50



## AIR LEAKAGE AND MECHANICAL VENTILATION

Building Envelope Surface Area: 1505.87 m<sup>2</sup>

Air Leakage Test Results at 50 Pa. 0.60 ACH  
(0.2 in H<sub>2</sub>O) =

Equivalent Leakage Area @ 10 Pa 574.80 cm<sup>2</sup>  
=

### Terrain Description

		Height (m)
@ Weather Station :	Open flat terrain, Anemometer: grass	10.0
@ Building site :	Suburban, forest Height of the highest ceiling:	6.7

### Local Shielding:

Walls:	Heavy
Flue :	Light

### Leakage Fractions-

Ceiling:	0.250
Walls:	0.600
Floors:	0.150

Normalized Leakage Area @ 10 Pa: 0.3817 cm<sup>2</sup>/m<sup>2</sup>

Estimated Airflow to cause a 5 Pa 92 L/s  
Pressure Difference:

Estimated Airflow to cause a 10 Pa 144 L/s  
Pressure Difference:

## F326 VENTILATION REQUIREMENTS

Kitchen, Living Room, Dining Room	3 rooms @ 5.0 L/s: 15.0 L/s
Utility Room	1 rooms @ 5.0 L/s: 5.0 L/s
Bedroom	1 rooms @ 10.0 L/s: 10.0 L/s
Bedroom	1 rooms @ 5.0 L/s: 5.0 L/s
Bathroom	2 rooms @ 5.0 L/s: 10.0 L/s
Basement Rooms	0.0 L/s

## CENTRAL VENTILATION SYSTEM

System Type:	HVI Certified HRV
Manufacturer:	vanEE

**Model Number:** 2400E ECM

**Fan and Preheater Power at 0.0 °C:** 21 Watts

**Fan and Preheater Power at -25.0 °C:** 34 Watts

**Preheater Capacity:** 0 Watts

**Sensible Heat Recovery Efficiency at 0.0 °C** 84%

**Sensible Heat Recovery Efficiency at - 25.0 °C** 65%

**Total Heat Recovery Efficiency in Cooling Mode** 68%

**Low Temperature Ventilation Reduction:** 0%

**Low Temperature Ventilation Reduction:** 0 L/s (0.0%)  
**Airflow Adjustment**

Vented combustion appliance depressurization limit: 5.00 Pa.

#### Ventilation Supply Duct

<b>Location:</b>	Main floor	<b>Type:</b>	Flexible
<b>Length:</b>	1.5 m	<b>Diameter:</b>	152.4 mm
<b>Insulation:</b>	1.4 RSI	<b>Sealing Characteristics:</b>	Very tight

#### Ventilation Exhaust Duct

<b>Location:</b>	Main floor	<b>Type:</b>	Flexible
<b>Length:</b>	1.5 m	<b>Diameter:</b>	152.4 mm
<b>Insulation:</b>	1.4 RSI	<b>Sealing Characteristics:</b>	Very tight

## SECONDARY FANS & OTHER EXHAUST APPLIANCES

	<b>Control</b>	<b>Supply (L/s)</b>	<b>Exhaust (L/s)</b>
<b>Other Fans</b>	Continuous	0.00	3.75
<b>Dryer</b>	Continuous	-	8.95

**Dryer is vented outdoors**

**Rated Fan Power** 2.85 Watts

## NEW ERS VENTILATION DATA

### Whole House Systems

**Air Distribution/circulation type:** Dedicated low volume ductwork  
**Air Distribution/circulation fan power:** 100.00 Watts

Operation schedule: 480.00 min/day

System # 1 Type: HRV  
 Manufacturer: vanEE  
 Model: 2400E ECM  
 Airflow Supply Rate: 45.02 L/s Exhaust: 45.02 L/s Fan Power: 21.00 Watts

### Supplementary Systems

System # 1 Type: Dryer  
 Manufacturer:  
 Model:  
 Airflow Supply Rate: 0.00 L/s Exhaust: 228.00 L/s Fan Power: 0.00 Watts  
 Operation schedule: 56.50 min/day

System # 2 Type: Range hood  
 Manufacturer:  
 Model:  
 Airflow Supply Rate: 0.00 L/s Exhaust: 74.99 L/s Fan Power: 57.00 Watts  
 Operation schedule: 72.00 min/day

System # 3 Type: Utility  
 Manufacturer: Solare Palau - distribution fan  
 Model: TD Silent 150S, 333cfm 65w continuous  
 Airflow Supply Rate: 0.00 L/s Exhaust: 0.00 L/s Fan Power: 0.00 Watts  
 Operation schedule: 72.00 min/day

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## AIR LEAKAGE AND MECHANICAL VENTILATION SUMMARY

F326 Required continous ventilation: 45.000 L/s (0.06 ACH)  
 Central Ventilation Supply Rate (): 45.024 L/s (0.06 ACH)  
 Other Continuous Supply Flow Rates: 0.000 L/s (0.00 ACH)  
 Other Continuous Exhaust Flow Rates: 3.750 L/s (0.01 ACH)  
 Total house ventilation is Balanced  
 Gross Air Leakage and Mechanical Ventilation Energy Load: 34441.551 MJ  
 Seasonal Heat Recovery Ventilator Efficiency: 78.232 %  
 Estimated Ventilation Electrical Load: 243.596 MJ  
 Heating Hours:  
 Estimated Ventilation Electrical Load: 9.304 MJ  
 Non-Heating Hours:

**Net Air Leakage and Mechanical  
Ventilation Load:**

34524.820 MJ

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**VENTILATION REQUIREMENTS**

Use:	F326
ACH:	0.06
Supply:	95.30 L/s
Exhaust:	95.30 L/s

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**SPACE HEATING SYSTEM**

PRIMARY Space Heating Fuel:	Electricity
Space Heating Equipment:	Air Source Heat Pump
Manufacturer:	Fujitsu Halcyon Mini-Split RLS
Model:	AHRI 7993245; AOU15RLS3H; ASU1

Capacity at 8.3 °C:	17.0 kW
HSPF at 8.3 °C:	13.30
COP at 8.3 °C:	5.78
Crankcase Heater Power:	60.00 watts
Heat Pump Temperature Cut-Off:	Balance point

SECONDARY Heating Fuel:	Electricity
Equipment:	Baseboard/Hydronic/Plenum(duct) htrs.
Manufacturer:	
Model:	
Calculated* Output Capacity:	17.00 kW
* Design Heat loss X 1.00 + 0.5 kW	
Steady State Efficiency:	100.00 %
Fan Mode:	Auto
ECM Motor:	Yes
Low Speed Fan Power:	0 watts
High Speed Fan Power:	490 watts

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**AIR CONDITIONING SYSTEM**

System Type:	Mini-split ductless		
Manufacturer:			
Model:			
Capacity:	27999 Watts		
SEER	25.30	Rated COP	4.338
Sensible Heat Ratio:	0.70		
Indoor Fan Flow Rate:	1889.27 L/s	Fan Power (watts)	903.26

<b>Ventilator Flow Rate:</b>	0.00 L/s	<b>Crankcase Heater Power (watts):</b>	60.00
<b>Fraction of windows Openable:</b>	0.000	<b>ECM Motor:</b>	Yes
<b>Cooling system capacity sizing factor:</b>	1.000		
<b>Economizer control:</b>	N/A	<b>Indoor Fan Operation:</b>	Auto

Air Conditioner is integrated with the Heating System

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## DOMESTIC WATER HEATING SYSTEM

<b>PRIMARY Water Heating Fuel:</b>	Electricity	
<b>Water Heating Equipment:</b>	Integrated heat pump	
<b>Heat Pump COP:</b>	3.82	
<b>Tank Energy Factor:</b>	0.900	
<b>Manufacturer:</b>	AO Smith	
<b>Model:</b>	Proline XE HPTU-66N	
<b>Tank Capacity:</b>	189.3 Litres	<b>Tank Blanket Insulation:</b> 0.0 RSI
<b>Tank Location:</b>	Basement	

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## ANNUAL DOMESTIC WATER HEATING SUMMARY

<b>Daily Hot Water Consumption:</b>	767.9 Litres
<b>Hot Water Temperature:</b>	55.0 °C
<b>Estimated Domestic Water Heating Load:</b>	61741 MJ
<b>Primary Domestic Water Heating Energy Consumption:</b>	16865 MJ
<b>Primary System Seasonal Efficiency:</b>	366.1%

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## PHOTOVOLTAIC SYSTEM

<b>Manufacturer:</b>	Canadian Solar	<b>Model:</b>	HiKu 400 watt modules
<b>Array area:</b>	196.5 m <sup>2</sup>	<b>Slope:</b>	45.0 Degrees
<b>Azimuth:</b>	0.0 Degrees		

Module type:	User Specified
Module efficiency:	15.0%
Normal operating cell temperature:	45.0 °C
Temperature coefficient of efficiency:	0.720 %/°C
Miscellaneous array losses:	3.0%
Other power conditioning losses:	1.0%
Inverter efficiency:	95.0%
PV energy absorption rate:	100.0%

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### **ANNUAL SPACE HEATING SUMMARY**

Gross Space Heat Loss:	196543 MJ
Gross Space Heating Load:	194925 MJ
Usable Internal Gains:	74748 MJ
Usable Internal Gains Fraction:	38.0 %
Usable Solar Gains:	61754 MJ
Usable Solar Gains Fraction:	31.4 %
Auxiliary Energy Required:	58423 MJ
Space Heating System Load:	58423 MJ
Heat Pump and Furnace Annual COP:	1.389
Heat Pump Annual Energy Consumption:	8034 MJ
Furnace/Boiler Annual Energy Consumption:	33588 MJ
Annual Space Heating Energy Consumption:	41623 MJ

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### **DESIGN SPACE HEATING AND COOLING LOADS**

Design Heat Loss* at -40.0 °C (6.59 Watts / m3):	16897 Watts
Design Cooling Load* for July at (25.0 ° C):	23207 Watts

\* Please refer to notes at the end of this report.

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### **ANNUAL SPACE COOLING SUMMARY**

Design Sensible Heat Ratio:	0.769
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Estimated Annual Space Cooling Energy: 4792.83 kWh

Seasonal COP ( January to December): 3.718

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### **BASE LOADS SUMMARY**

	kwh/day	Annual kWh
Interior Lighting	10.20	3723.00
Appliances	31.08	11343.59
Other	26.40	9636.00
Exterior Use	2.40	876.00
HVAC Fans		
HRV/Exhaust	0.26	95.22
Space Heating	0.34	124.32
Space Cooling	2.08	757.43
Total Average Electrical Load	72.75	26555.55

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### **FAN OPERATION SUMMARY (kWh)**

Hours	HRV/Exhaust Fans	Space Heating	Space Cooling
Heating	77.3	124.3	0.0
Neither	0.1	0.0	0.0
Cooling	17.8	0.0	757.4
Total	95.2	124.3	



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**ENERGY CONSUMPTION SUMMARY REPORT**

Estimated Annual Space Heating Energy Consumption	= 42070.12 MJ	= 11686.14 kWh
Ventilator Electrical Consumption: Heating Hours	= 243.60 MJ	= 67.67 kWh
Estimated Annual DHW Heating Energy Consumption	= 16865.27 MJ	= 4684.80 kWh
<b>ESTIMATED ANNUAL SPACE + DHW ENERGY CONSUMPTION</b>	<b>= 59178.98 MJ</b>	<b>= 16438.61 kWh</b>

Estimated Greenhouse Gas Emissions 0.011 tonnes/year

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**ESTIMATED ANNUAL FUEL CONSUMPTION SUMMARY**

Fuel	Space Heating	Space Cooling	DHW Heating	Baseloads	Ventilation	Total
Electricity (kWh)	11753.8	4792.8	4684.8	25578.6	95.2	46837.6
PV generation applied to electrical consumption (kWh) :						42287.5
Net electrical consumption (kWh) :						4550.1

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**ESTIMATED ANNUAL FUEL CONSUMPTION COSTS**

Fuel Costs Library = Embedded

RATE	Electricity (Ott 18)	Natural Gas (Ottawa18)	Oil (Ott 18)	Propane (Ott 18)	Wood (Ottc 18)	Total
\$	786.10	0.00	0.00	0.00	0.00	786.10

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**Fuel Costs Library Listing**

Filename = Embedded

<b>Record # 1</b>	Fuel: Electricity		
Rate ID = Ott 18	Hydro Rate Block		
Rate Block		Dollars	Charge
	kWhr	Per kWhr	(\$)
Minimum	0.0		10.000
1	1000.0	0.1200	
2	99999.0	0.1600	

<b>Record # 2</b>		Fuel: Natural Gas		
Rate ID = Ottawa18		Gas Rate Block		
Rate Block			Dollars	Charge
	m3		Per m3	(\$)
Minimum	0.0			20.000
1	30.0		0.2680	
2	55.0		0.2620	
3	170.0		0.2555	
4	99999.0		0.2540	
<b>Record # 3</b>		Fuel: Oil		
Rate ID = Ott 18		Oil Rate Block		
Rate Block			Dollars	Charge
	Litre		Per Litre	(\$)
Minimum	0.0			10.000
1	99999.0		1.1200	
<b>Record # 4</b>		Fuel: Propane		
Rate ID = Ott 18		Propane Rate Block		
Rate Block			Dollars	Charge
	Litre		Per Litre	(\$)
Minimum	0.0			0.000
1	99999.0		0.8600	
<b>Record # 5</b>		Fuel: Wood		
Rate ID = Ottc 18		Cord Rate		
Rate Block			Dollars	Charge
	Cord		Per Cord	(\$)
Minimum	0.0			0.000
1	7.0		300.0000	
2	99999.0		225.0000	

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**MONTHLY ENERGY PROFILE**

Month	Energy Load (MJ)	Internal Gains (MJ)	Solar Gains (MJ)	Aux. Energy (MJ)	HRV Eff. %
Jan	31969.2	7076.3	8449.4	16443.6	66.5
Feb	26753.5	6587.7	9636.8	10529.0	69.8
Mar	23825.1	7454.9	10819.9	5550.3	76.7
Apr	15960.5	7206.9	7712.0	1041.6	82.1
May	10335.1	6624.8	3710.3	0.0	82.1
Jun	6216.7	5135.9	1080.7	0.0	81.0
Jul	3767.1	3548.1	219.0	0.0	83.2
Aug	4621.9	4197.7	424.2	0.0	83.2
Sep	8674.2	6104.6	2569.6	0.0	83.0
Oct	13526.4	7037.1	4981.6	1507.7	83.1
Nov	19922.7	6770.5	5534.9	7617.3	80.3
Dec	29352.5	7003.9	6615.1	15733.6	70.0
Ann	194924.9	74748.3	61753.6	58423.1	78.2

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**FOUNDATION ENERGY PROFILE**

Month	Heat Loss (MJ)				Total
	Crawl Space	Slab	Basement	Walkout	
Jan	0.0	0.0	0.0	0.0	0.0
Feb	0.0	0.0	0.0	0.0	0.0
Mar	0.0	0.0	0.0	0.0	0.0
Apr	0.0	0.0	0.0	0.0	0.0
May	0.0	0.0	0.0	0.0	0.0
Jun	0.0	0.0	0.0	0.0	0.0
Jul	0.0	0.0	0.0	0.0	0.0
Aug	0.0	0.0	0.0	0.0	0.0
Sep	0.0	0.0	0.0	0.0	0.0
Oct	0.0	0.0	0.0	0.0	0.0
Nov	0.0	0.0	0.0	0.0	0.0
Dec	0.0	0.0	0.0	0.0	0.0
Ann	0.0	0.0	0.0	0.0	0.0

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**FOUNDATION TEMPERATURES & VENTILATION PROFILE**

Month	Temperature (Deg °C)			Air Change Rate		Heat Loss (MJ)
	Crawl Space	Basement	Walkout	Natural	Total	

Jan	0.0	17.9	0.0	0.044	0.069	6911.2
Feb	0.0	18.0	0.0	0.041	0.066	5540.4
Mar	0.0	18.2	0.0	0.034	0.059	4394.8
Apr	0.0	18.4	0.0	0.025	0.050	2434.1
May	0.0	18.7	0.0	0.017	0.042	1309.3
Jun	0.0	19.0	0.0	0.012	0.037	646.7
Jul	0.0	19.4	0.0	0.008	0.032	288.1
Aug	0.0	19.2	0.0	0.009	0.034	406.8
Sep	0.0	18.7	0.0	0.016	0.041	1045.2
Oct	0.0	18.5	0.0	0.023	0.047	1895.9
Nov	0.0	18.2	0.0	0.031	0.056	3442.5
Dec	0.0	18.0	0.0	0.041	0.066	6087.8
Ann	0.0	18.5	0.0	0.025	0.050	34403.0

### SPACE HEATING SYSTEM PERFORMANCE

Month	Space Heating Load (kWh)	Furnace Input (kWh)	Pilot Light (kWh)	Indoor Fans (kWh)	Heat Pump Input (kWh)	Total Input (kWh)	System Cop
Jan	4567.7	3319.6	0.0	46.5	405.0	3771.1	1.211
Feb	2924.7	1917.6	0.0	24.4	345.6	2287.7	1.278
Mar	1541.8	546.8	0.0	6.0	359.1	911.8	1.691
Apr	289.3	1.8	0.0	-0.0	117.7	119.4	2.422
May	0.0	0.0	0.0	0.0	0.0	0.0	0.000
Jun	0.0	0.0	0.0	0.0	0.0	0.0	0.000
Jul	0.0	0.0	0.0	0.0	0.0	0.0	0.000
Aug	0.0	0.0	0.0	0.0	0.0	0.0	0.000
Sep	0.0	0.0	0.0	0.0	0.0	0.0	0.000
Oct	418.8	0.3	0.0	-0.0	119.4	119.7	3.500
Nov	2115.9	435.5	0.0	5.0	497.8	938.3	2.255
Dec	4370.4	3108.4	0.0	42.4	387.2	3538.0	1.235
Ann	16228.6	9330.1	0.0	124.3	2231.7	11686.1	1.389

### AIR CONDITIONING SYSTEM PERFORMANCE

Month	Sensible Load (MJ)	Latent Load (MJ)	AirCond Energy (kWh)	Fan Energy (kWh)	Ventilator Energy (kWh)	Crankcase Heater (kWh)	Total Energy (kWh)	COP	Av.RH %
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Jan	34.8	4.6	3.1	0.6	0.0	0.0	3.7	3.0	38.3
Feb	462.1	41.5	37.9	7.1	0.0	0.0	45.0	3.1	38.3
Mar	3344.6	205.0	248.5	47.4	0.0	0.0	295.8	3.3	37.6
Apr	7373.9	350.9	489.2	95.6	0.0	0.0	584.7	3.7	33.3
May	7231.8	559.3	484.5	93.0	0.0	1.7	579.2	3.7	32.8
Jun	9189.8	969.1	625.7	116.9	0.0	0.0	742.7	3.8	33.1
Jul	11985.8	1418.1	828.0	150.6	0.0	0.0	978.6	3.8	33.3
Aug	10914.7	1351.3	754.0	138.7	0.0	0.0	892.7	3.8	33.6
Sep	5739.4	717.9	406.4	77.6	0.0	0.4	484.4	3.7	34.8
Oct	1859.2	233.2	143.0	27.5	0.0	0.0	170.5	3.4	36.0
Nov	132.1	19.3	11.6	2.2	0.0	0.0	13.8	3.0	37.4
Dec	13.2	2.6	1.4	0.3	0.0	0.0	1.6	2.7	40.6
Ann	58281.4	5872.7	4033.3	757.4	0.0	2.1	4792.8	3.7	34.2

### MONTHLY ESTIMATED ENERGY CONSUMPTION BY DEVICE (MJ)

Month	Space Heating		DHW Heating		Lights & Appliances	HRV & FANS	Air Conditioner
	Primary	Secondary	Primary	Secondary			
Jan	1458.0	11950.6	1474.8	0.0	7820.7	206.2	11.2
Feb	1244.3	6903.5	1341.9	0.0	7063.9	144.8	136.5
Mar	1292.7	1968.5	1483.6	0.0	7820.7	222.3	894.5
Apr	423.5	6.6	1433.8	0.0	7568.5	370.1	1760.9
May	0.0	0.0	1463.3	0.0	7820.7	361.3	1750.2
Jun	0.0	0.0	1385.2	0.0	7568.5	446.4	2252.7
Jul	0.0	0.0	1399.5	0.0	7820.7	568.5	2980.8
Aug	0.0	0.0	1376.2	0.0	7820.7	525.6	2714.4
Sep	0.0	0.0	1323.5	0.0	7568.5	304.8	1464.7
Oct	429.7	1.1	1380.5	0.0	7820.7	125.4	514.7
Nov	1792.1	1567.8	1361.3	0.0	7568.5	53.2	41.7
Dec	1393.9	11190.3	1441.7	0.0	7820.7	188.3	5.0
Ann	8034.2	33588.3	16865.3	0.0	92082.9	3517.1	14527.4

### ESTIMATED FUEL COSTS (Dollars)

Month	Electricity	Natural Gas	Oil	Propane	Wood	Total
Jan	75.74	0.00	0.00	0.00	0.00	75.74
Feb	10.00	0.00	0.00	0.00	0.00	10.00
Mar	10.00	0.00	0.00	0.00	0.00	10.00
Apr	10.00	0.00	0.00	0.00	0.00	10.00

May	10.00	0.00	0.00	0.00	0.00	10.00
Jun	10.00	0.00	0.00	0.00	0.00	10.00
Jul	10.00	0.00	0.00	0.00	0.00	10.00
Aug	10.00	0.00	0.00	0.00	0.00	10.00
Sep	10.00	0.00	0.00	0.00	0.00	10.00
Oct	10.00	0.00	0.00	0.00	0.00	10.00
Nov	10.00	0.00	0.00	0.00	0.00	10.00
Dec	610.36	0.00	0.00	0.00	0.00	610.36
Ann	786.10	0.00	0.00	0.00	0.00	786.10

---

**PHOTOVOLTAIC SYSTEM MONTHLY PERFORMANCE : System -1-**

Canadian  
Solar,  
HiKu 400  
watt  
modules

Month	Solar Radiation on Horizontal Surface MJ/m <sup>2</sup> /day	Air Temperature °C	Solar Radiation on Tilted Surface MJ/m <sup>2</sup> /day	Average Solar Power Watts	Available Energy kWh
Jan	3.91	-23.4	12.05	4217.1	2980.7
Feb	7.69	-20.6	17.20	6180.4	3945.5
Mar	13.38	-13.1	21.58	7678.4	5427.1
Apr	18.33	-3.1	22.33	7596.9	5196.3
May	20.40	5.2	20.30	6521.1	4609.1
Jun	20.08	11.8	18.81	5743.9	3928.8
Jul	19.70	16.1	18.91	5608.3	3964.0
Aug	15.77	14.7	16.70	5104.2	3607.7
Sep	9.99	8.1	12.21	3954.1	2704.6
Oct	5.64	1.4	8.77	2892.3	2044.3
Nov	3.34	-8.6	7.74	2572.4	1759.5
Dec	2.72	-19.8	8.80	2999.3	2119.9
Annual	11.77	-2.5	15.44	5081.4	42287.5

---

**\*\*\* DISTRIBUTION OF PHOTOVOLTAIC SYSTEM GENERATION (kWh) \*\*\***

Electrical	Available	PV	Net Electrical
------------	-----------	----	----------------

Month	Load	PV Energy	Utilized	Load
Jan	6367.1	2980.7	5819.3	547.9
Feb	4676.4	3945.5	4676.4	0.0
Mar	3800.6	5427.1	3800.6	0.0
Apr	3212.1	5196.3	3212.1	0.0
May	3165.4	4609.1	3165.4	0.0
Jun	3236.9	3928.8	3236.9	0.0
Jul	3547.1	3964.0	3547.1	0.0
Aug	3454.7	3607.7	3454.7	0.0
Sep	2961.5	2704.6	2961.5	0.0
Oct	2853.4	2044.3	2853.4	0.0
Nov	3440.2	1759.5	3440.2	0.0
Dec	6122.2	2119.9	2119.9	4002.2
Annual	46837.6	42287.5	42287.5	4550.1

The calculated heat losses and energy consumptions are only estimates, based upon the data entered and assumptions within the program. Actual energy consumption and heat losses will be influenced by construction practices, localized weather, equipment characteristics and the lifestyle of the occupants.

# HOMEOWNER INFORMATION SHEET

# ENERGUIDE

Your EnerGuide\* rating and this report are based on data collected and, where necessary, presumed from your evaluation. Rating calculations are made using standard operating conditions.



**Rating: 0** gigajoules per year (GJ/year)

Heated floor area: 1442.5 m<sup>2</sup> (15526.9 ft<sup>2</sup>)

Rated energy intensity: 0.11 GJ/m<sup>2</sup>/year

Evaluated by: Ross Elliott

Quality assured by: Homesol Building Solutions Inc.

File number: 4G01P99998

Data collected: December 6, 2018

Year built: 2019

[NRCan.gc.ca/myenerguide](http://NRCan.gc.ca/myenerguide)

## HOW YOUR RATING IS CALCULATED:

- I. Rated annual energy consumption 152 GJ/year  
 II. Minus renewable energy contribution - 152 GJ/year  
 Equals your **EnerGuide rating** = 0 GJ/year

I. Your rated annual energy consumption is the total amount of energy your building would use in a year based on the EnerGuide Rating System standard operating conditions. For your building, this includes 61.99 GJ of passive solar gain.

Energy Sources	Rated Consumption (GJ/year)	Equivalent Units (per year)	Greenhouse Gas Emissions (tonnes/year)
Electricity	152	42233 kWh	0.1
Total	152		0.1

II. On-site renewable power generation systems can offset some or even all of your energy consumption. Renewable energy contributions are factored differently for your rating and your greenhouse gas emissions calculations.<sup>1</sup>

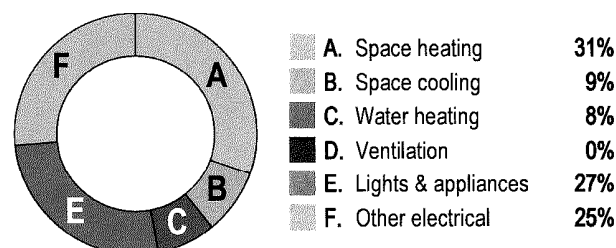
On-Site Renewable Energy	Estimated Contribution (GJ/year)	Equivalent Units (per year)	Offset Greenhouse Gas Emissions (tonnes/year)
Electricity	152	42287 kWh	0.1
Solar water heating	0	0	0.0
Total	152		0.1

## YOUR RATED GREENHOUSE GAS EMISSIONS CALCULATION:

Total greenhouse gas emissions 0.1 tonnes/year  
 Minus emissions offset by on-site renewables - 0.1 tonnes/year  
 Equals your **rated greenhouse gas emissions** = 0.0 tonnes/year

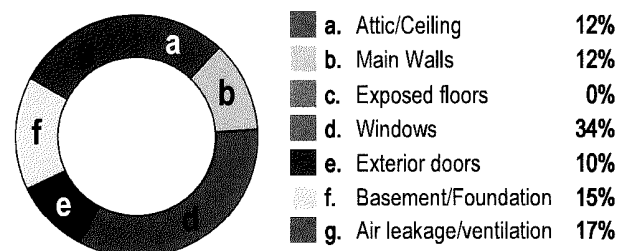
## HOW YOUR RATED ENERGY IS USED:

The chart below represents the breakdown of rated annual energy consumption in your building under standard operating conditions. You can use these figures as a guide to help identify where you can lower energy costs through proper maintenance, efficient operation, energy efficiency renovations or equipment replacement.



## WHERE YOUR BUILDING LOSES HEAT:

Buildings lose heat through their exterior shell, or building envelope. The chart below shows where and how your building loses heat. The quality and upkeep of your building can have a major impact on the amount of energy your heating and cooling systems use annually.



\*EnerGuide is an official mark of Natural Resources Canada. Refer to the glossary section for an explanation of relevant terms.



## BUILDING DETAILS

## BUILDING ENVELOPE

## ATTIC/CEILING

TYPE	INSULATION VALUE		AREA m <sup>2</sup> (ft <sup>2</sup> )
	Nominal RSI (R)	Effective RSI (R)	
Ceiling - lower: Attic/gable	14.14 (80.3)	14.21 (80.7)	156.4 (1684)
Ceiling - upper1: Attic/gable	14.14 (80.3)	14.21 (80.7)	188.3 (2027)
Ceiling - upper2: Attic/gable	14.14 (80.3)	14.21 (80.7)	188.3 (2027)

## MAIN WALLS

TYPE	INSULATION VALUE		AREA m <sup>2</sup> (ft <sup>2</sup> )
	Nominal RSI (R)	Effective RSI (R)	
Wall - BUFFERED	10.17 (57.7)	9.80 (55.6)	72.5 (780)
Wall - lower1	10.17 (57.7)	9.80 (55.7)	93 (1001)
Wall - lower2	10.17 (57.7)	9.80 (55.7)	93 (1001)
Wall - upper	10.17 (57.7)	9.83 (55.8)	198 (2131)

## WINDOWS

#	TYPE	U-factor W/m <sup>2</sup> • °C (Btu/h • ft <sup>2</sup> • °F)	RSI (R)
10	Window - 5	1 (0)	0.97 (5.5)
20	Window - E	1 (0)	0.98 (5.6)
22	Window - D	1 (0)	0.99 (5.6)
14	Window - A	1 (0)	1.01 (5.7)
4	Window - B	1 (0)	1.02 (5.8)
Total window area: 89.63 m <sup>2</sup> (964.8 ft <sup>2</sup> )			

## EXTERIOR DOORS

#	TYPE	U-factor W/m <sup>2</sup> • °C (Btu/h • ft <sup>2</sup> • °F)	RSI (R)
16	Fibreglass medium density spray foam core	1 (0)	0.98 (5.6)
Total door area: 31.1 m <sup>2</sup> (334 ft <sup>2</sup> )			

## BASEMENT/FOUNDATION

TYPE	INSULATION VALUE		AREA m <sup>2</sup> (ft <sup>2</sup> )
	Nominal RSI (R)	Effective RSI (R)	
Basement - 1 concrete walls: exterior	4.23 (24.0)	4.23 (24.0)	77.7 (836)
Basement - 1 concrete walls: interior	7.37 (41.9)	7.18 (41.0)	77.7 (836)
Basement - 1 slab	4.23 (24.0)	4.23 (24.0)	191.3 (2059)

## BASEMENT/FOUNDATION (Continued)

TYPE	INSULATION VALUE		AREA m <sup>2</sup> (ft <sup>2</sup> )
	Nominal RSI (R)	Effective RSI (R)	
Basement - 2 concrete walls: exterior	4.23 (24.0)	4.23 (24.0)	77.7 (836)
Basement - 2 concrete walls: interior	7.37 (41.9)	7.18 (41.0)	77.7 (836)
Basement - 2 slab	4.23 (24.0)	4.23 (24.0)	191.3 (2059)

## AIRTIGHTNESS

Air leakage rate at 50 pascals	0.6 air changes / hour
Equivalent leakage area	574.8 cm <sup>2</sup> (89 in <sup>2</sup> )
Normalized leakage area	0.4 cm <sup>2</sup> / m <sup>2</sup> (0.5 in <sup>2</sup> / 100 ft <sup>2</sup> )

## MECHANICAL SYSTEMS

Mechanical systems displayed may not reflect actual systems as some of them may have been combined for simulation purposes.

## SPACE HEATING

TYPE	OUTPUT SIZE	EFFICIENCY
Electric baseboard	17 kW 58500 BTU/h	100% Steady State
Mini-split air-source heat pump	17 kW 58500 BTU/h	13.3HSPF
Design heating load: 16.9 kW		

## SPACE COOLING

TYPE	OUTPUT SIZE	EFFICIENCY
Mini-split air-source heat pump	17 kW 58500 BTU/h	25.3 SEER
Design cooling load: 23.21 kW		

## WATER HEATING

TYPE	TANK VOLUME	EFFICIENCY
Integrated heat pump	189L (50 USG)	0.90 EF

## PRINCIPAL VENTILATION

TYPE	AIR FLOW RATE	EFFICIENCY
Home Ventilating Institute listed ENERGY STAR certified heat recovery ventilator	45.02 L/s (95 cfm)	84%

## HEATED FLOOR AREA

Above-grade area	909.5 m <sup>2</sup> (9789.8 ft <sup>2</sup> )
Below-grade area	533 m <sup>2</sup> (5737 ft <sup>2</sup> )

## RENEWABLE ENERGY READINESS

Your home has been designed to meet CanmetENERGY's Solar Ready Guidelines. This means it has been designed to easily accommodate a solar energy system. For details on the Solar Ready Guidelines, please visit <http://www.nrcan.gc.ca/energy/efficiency/housing/research/5141>

## BUILDING DETAILS

### WARNINGS



The results of the energy simulation determined that this building may not receive sufficient outdoor air to maintain good indoor air quality. Please seek additional information from your energy advisor and a qualified ventilation contractor.

### REDUCED USE ASSUMPTIONS (PER UNIT)

Your EnerGuide Rating includes reductions to the Standardized Occupant and Use Assumptions defined in the glossary.

#### Hot water use savings of 121.73 L/day

Your house is equipped with the following hot water saving fixtures and/or equipment:

Low-flow showerheads

Low-flow bathroom faucets

ENERGY STAR Clothes washer

ENERGY STAR Dishwasher

#### Lighting Savings of 9.6kWh/day

Your house qualifies for the high-efficiency lighting package as more than 75% of fixtures are equipped with CFLs or LEDs

## GLOSSARY

**Airtightness**

describes how well the building envelope resists air leakage and is measured in air changes per hour at 50 pascals (ACH@50 Pa). The fewer air changes per hour, the more airtight the building envelope is. Equivalent leakage area is another way of describing the airtightness of the building envelope. It represents the size of a single hole in your building envelope if all the individual air leakage holes or gaps were added together. The smaller the equivalent leakage area, the less energy you will need to control the temperature of your building (but you will still need to ensure that you have adequate ventilation).

**Design heating/cooling loads**

provide an estimate of the capacity of the heating and cooling equipment needed to maintain your building at 22 °C in the winter and 24 °C in the summer and are provided for guidance only. Before having a new heating/cooling system installed, your heating/cooling contractor should perform an independent, detailed heat loss/heat gain calculation in order to select the appropriate equipment.

**Gigajoule (GJ)**

is a unit of energy. It can be used as a measure of any type of energy that is consumed or produced. Specifically, one GJ is the equivalent of 278 kWh of electricity, 27m³ of natural gas, 26 L of oil, 39 L of propane, or 947 817 BTUs. One GJ is roughly equal to the energy from two standard barbeque propane tanks or 30 litres of gas in a car's gas tank.

**Greenhouse gas emissions**

are the amounts of carbon dioxide, methane and nitrous oxide that are produced directly, by burning fossil and solid fuels, or indirectly, through the production of electricity. Greenhouse gas emissions are expressed in carbon dioxide equivalent units. Greenhouse gas emissions are calculated by multiplying the quantity of fuel or electricity used in your building by the emission factors for the particular energy source. Electricity factors vary by province/territory because there are different emissions associated with the method used to produce electricity. One tonne of greenhouse gas emissions is equivalent to the CO<sub>2</sub> emissions produced by driving an average efficiency mid-size vehicle from Toronto to Vancouver.

**Heated floor area**

represents the total useable area of your building that is heated, measured at the interior of the outer walls or of the walls attached to other buildings.

**Insulation values**

Are expressed in RSI (m² · °C/W) or R-value (h · ft² · °F/Btu) and represent the resistance to the flow of heat of a given thickness of insulation or construction assembly. The higher the RSI-value (R-value), the better the performance. The nominal value represents the resistance to the flow of heat of just the insulation while the effective value represents the resistance to the flow of heat of the entire wall, ceiling or floor assembly considering the structure, insulation, framing, sheathing and all finishing.

**On-site renewable energy contributions**

are subtracted from the rated annual energy consumption to

calculate the EnerGuide rating. For the calculation of the rated greenhouse gas emissions, on-site electricity generation only offsets emissions associated with electricity consumption, whereas a solar water heater reduces the emissions that would have been produced from the source of energy used to heat water.

**Passive solar gain**

is the heat from the sun that influences your building's heating and cooling requirements. Generally, south facing windows provide more solar gain.

**Rated energy intensity**

is calculated by dividing your rated annual energy consumption by your building's heated floor area. It allows you to compare the annual energy use of buildings of different sizes on a "per square metre" basis.

**Standard operating conditions**

have been used to calculate your building's EnerGuide Rating. The rating assumes a standard number of occupants and energy use patterns. This allows for comparison of energy use across buildings so that the building is rated and not its operation by the occupants. The values are:

- Two adults, at home 50% of the time;
- Hot water use of 121-128 L/day, variable depending on incoming ground water temperature;
- Thermostat settings of 21°C for daytime heating, 18°C for nighttime heating and 25°C for cooling; and
- Lighting, appliance and other electrical loads of 11.7 kWh/day.

**U-factor**

measures heat transferred through windows and doors, expressed in W/m² · °C (BTU/h · ft² · °F). The lower the U-factor, the better the energy efficiency of a window. The inverse of U-factor (1/U-factor) identifies the resistance to the flow of heat, expressed in RSI. The higher the RSI, the better the window is at resisting heat loss. You can use these values to choose more energy efficient windows.

For more details and additional terms, please visit [NRCan.gc.ca/myenerguide](http://NRCan.gc.ca/myenerguide).

123 Anystreet,  
Eastmain, QUEBEC, J0M0B3

# ENERGUIDE

Data collected: December 6, 2018

File number: **4G01P99998**

Evaluated by: Ross Elliott

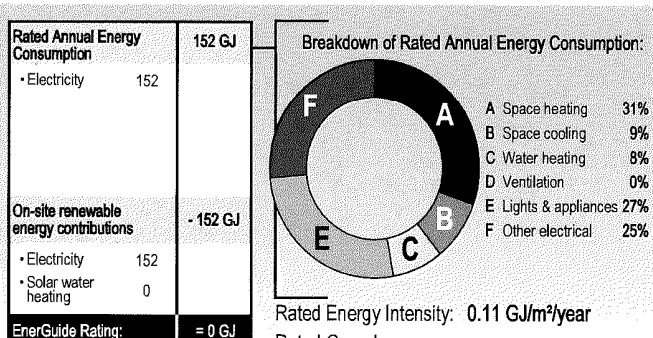
**0** ★ This Building produces more energy than it uses on an annual basis  
GJ/year



**0** GJ/year  
Best energy performance

**416** GJ/year  
Reference rating  
Uses most energy

One gigajoule (GJ) equals the energy from two BBQ propane tanks



The energy consumption indicated on your utility bills may be higher or lower than your EnerGuide rating. This is because standard assumptions have been made regarding how many people live in your house and how the home is operated. Your rating is based on the condition of your house on the day it was evaluated.

Quality assured by: Homesol Building Solutions Inc.

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## NEXT STEPS

If you have had a Renovation Upgrade Service, refer to your report for the roadmap to making your building more energy efficient. If you have not yet had a Renovation Upgrade Service, why not contact your service organization to learn what you can do to save on energy costs, reduce greenhouse gas emissions and improve comfort?

Everyone uses energy in their building differently. This report was developed using standard operating conditions as explained in the glossary. Therefore, your EnerGuide rating will not match your utility bills.

## UPGRADE CONSIDERATIONS

Before undertaking upgrades or renovations, find out about appropriate products and installation techniques, and ensure that all renovations meet local building codes and by-laws. Natural Resources Canada does not endorse the services of any contractor, nor any specific product, and accepts no liability in the selection of materials, products, contractors nor performance of workmanship.

Where your energy advisor has identified a potential health or safety concern such as insufficient outdoor air, risk of combustion fumes entering your building or risk of exposure to asbestos, they have endeavoured to provide a warning in this report. However, energy advisors are not required to have expertise in health and safety matters, and building owners are solely responsible for consulting a qualified professional to determine potential hazards before undertaking any upgrades or renovations.

Visit us today at:

**[NRCan.gc.ca/myenerguide](http://NRCan.gc.ca/myenerguide)**

# BUILDING ENERGY MODEL REPORT

Eastmain Accessible Home  
*NORDEC Consulting and Design*

February 8, 2019



**ReNü**  
ENGINEERING

Project No: C18-652

NORDEC Consulting and Design  
ATTN: Bill Semple  
[REDACTED]

February 8, 2019

**REGARDING: Eastmain Accessible Home – Preliminary Energy Modeling and Mechanical HVAC System Evaluation**

Dear Bill,

This report presents a summary of the energy modeling analysis completed to date for the Eastmain Accessible Home in Eastmain, Quebec. Based on the plans provided, the house has been modeled using IES VE, a dynamic annual building modeling program. The following building envelope performance data was used:

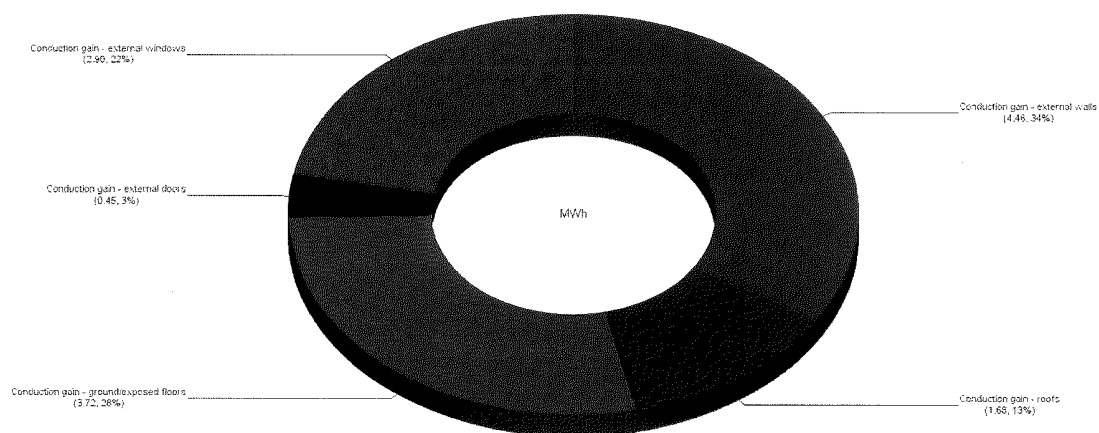
- **Basement Floor:** 6" EPS, 3" concrete slab ( $R_{eff} = 26$ )
- **External Crawl Space Walls:** 2.5" EPS / 6" Concrete / 2.5" EPS ICF, interior 2x4 spaced 24" o.c. with Roxul batt insulation ( $R_{eff} = 38$ )
- **External Above Ground Walls:** 12" double stud walls with 2x4 spaced 24" o.c. with cellulose insulation, interior 2x4 spaced 24" o.c. with roxul batt insulation ( $R_{eff} = 56$ )
- **Roof Assembly:** vented attic with 24" cellulose insulation ( $R_{eff} = 83$ )
- **Windows and glazed doors:** Triple glazing (SHGC 0.36, R9 glass, R3.5 frame;  $R_{eff} = 7.7$ )
- **Doors:**  $R_{eff} = 5$
- **Airtightness:** 0.6ACH@50Pa
- **HRV (Heat Recovery Ventilator):** Minimum 77% ASRE at 0°C
- **Heating and Cooling Setpoints:** 22°C and 25°C
- **Occupancy:** 3 people (2 Bedrooms + 1)
- **ASHRAE Weather File:** La Grande Riviere, Quebec, Climate Zone: 8



## BUILDING ENERGY LOSSES AND INTERNAL GAINS

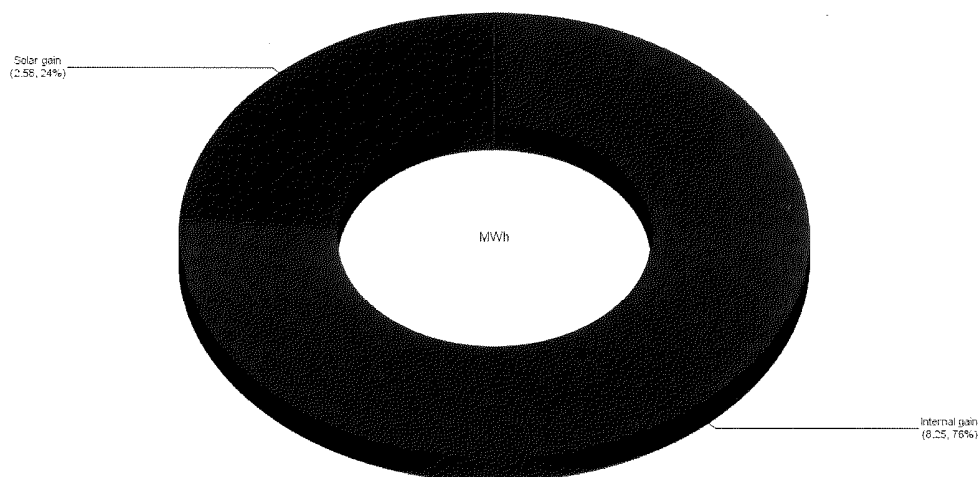
Figures 1 and 2 below show the breakdown of the energy losses and internal gains.

Figure 1: Eastmain Accessible Conduction energy losses. Heating setpoint 22°C and cooling setpoint 25°C. Loads assume dedicated ventilation via a minimum 77% efficient HRV. Windows solar heat gain coefficient (SHGC) = 0.36. The building was assumed to have an air tightness of 0.6 ACH50.



	External Walls	Roof	Ground Floor	External Door	External Windows	Total
Annual Gain/Loss (MWh)	-4.5	-1.7	-3.7	-0.4	-2.9	-13.2
Area (m2)	191	116	114	2	13	436

Figure 2: Eastmain Accessible Home internal gains and solar gains. Heating setpoint 22°C and cooling setpoint 25°C. Loads assume dedicated ventilation via a minimum 77% efficient HRV. Windows solar heat gain coefficient (SHGC) = 0.36. The building was assumed to have an air tightness of 0.6 ACH50.



	Internal Gain	Solar Gain
Annual Gain/Loss (MWh)	8.2	2.6

## HVAC SYSTEM OPTIONS

Three HVAC system options were analyzed and are presented in Table 1, with the goal of achieving or nearly achieving Net Zero Energy (NZE) performance while maintaining occupant comfort.

The Option 1 HVAC system consists of a ducted mini-split electric ASHP heating and cooling system, with auxiliary electric resistant duct heater, heat pump water heater (HPWH), HRV 77% ASRE, and a rooftop PV system. The fire place was not included in the heating system energy analysis. The ducted mini-split ASHP cut-off temperature is  $-26^{\circ}\text{C}$  and the auxiliary electric resistant duct heater provides heating at temperatures less than  $-26^{\circ}\text{C}$ . The ducted mini-split ASHP system can provide adequate air distribution to each room. The HPWH is in the Storage Room and therefore was modeled with an COP of 1.51, adjusted for ASHP and electric resistant duct heater space heating.

The Option 2 HVAC system consists of a ductless mini-split electric ASHP heating and cooling system, with electric baseboard heating in each room, HPWH, HRV 77% ASRE, and a rooftop photovoltaic (PV) renewable energy generation system. The fire place was not included in the heating system energy analysis. The ductless mini-split ASHP cut-off temperature is  $-26^{\circ}\text{C}$  and it is intended that electric baseboards will provide heating at temperatures less than  $-26^{\circ}\text{C}$ . However, the inadequate air distribution of the ductless mini-split ASHP from the living room / kitchen area will result in increased use of the baseboard heating system in all other rooms. Therefore, the living room / kitchen area were modeled with the ASHP heating at temperatures greater than  $-26^{\circ}\text{C}$ , and baseboard heating at temperatures less than  $-26^{\circ}\text{C}$ . All other rooms were modeled with the baseboard heating system. The HPWH is in the Storage Room and therefore was modeled with a COP of 1.0.

The Option 3 HVAC system consists of a ductless mini-split electric ASHP heating and cooling system, with three indoor units located in the living room / kitchen area and one in each bedroom, electric baseboard heating in each room, HPWH, HRV 77% ASRE, and a rooftop photovoltaic (PV) renewable energy generation system. The fire place was not included in the heating system energy analysis. The ductless mini-split ASHP cut-off temperature is  $-26^{\circ}\text{C}$  and it is intended that electric baseboards will provide heating at temperatures less than  $-26^{\circ}\text{C}$ . However, the inadequate air distribution of the ductless mini-split ASHP to rooms that do not contain an indoor unit will result in increased use of the baseboard heating system in these other rooms. Therefore, the living room / kitchen area and the bedrooms were modeled with the ASHP heating at temperatures greater than  $-26^{\circ}\text{C}$ , and baseboard heating at temperatures less than  $-26^{\circ}\text{C}$ . All other rooms were modeled with the baseboard heating system. The HPWH is in the Storage Room and therefore was modeled with a COP of 1.0.



Table 1: Comparative energy consumption and life cycle cost estimation for three different HVAC strategies presented for the Eastmain Accessible Home. ASHP Heating COP 2.00, Cooling COP 4.0. Baseboard heating COP 1.00. Auxiliary electric resistant duct heating COP 1.00. HPWH COP 1.00/1.51. PV system 13.5 kW, 300 W/panel, 45 roof mounted panel system, tilt of 28°. Energy rates constant at \$0.0591/kWh electricity. No inflation nor escalation over time has been included. Major equipment costs are estimated and provided for comparative purposes only; actual costs shall be obtained from a local contractor.

	Option 1	Option 2	Option 2
Space Heating Option	Ducted Mini-Split (all spaces, Baseboard Heating Back-Up	Ductless Mini-Split (Living Room/Kitchen), Baseboard Heating (all other spaces)	Ductless Mini-Split (Living Room/Kitchen, Bedrooms, Baseboard Heating (all other spaces)
DHW Heating Option	HPWH	HPWH	HPWH
Space Cooling Option	Ducted Mini-Split	Ductless Mini-Split	Ductless Mini-Split
Annual Space Heating Demand (ASHP)	6,787 kWh	581 kWh	1,492 kWh
Annual Space Heating Demand (Baseboards)	1,746 kWh	7,953 kWh	7,042 kWh
Space Heating Coefficient of Performance (COP), ASHP	2.00	2.00	2.00
Space Heating Coefficient of Performance (COP), Baseboards	1.00	1.00	1.00
Annual Heating Consumption	5,139 kWh	8,243 kWh	7,788 kWh
Annual Cooling Demand	338 kWh	338 kWh	338 kWh
Space Cooling COP	4.00	4.00	4.00
Annual Cooling Consumption	85 kWh	85 kWh	85 kWh
Annual DHW Heating Demand	4,082 kWh	4,082 kWh	4,082 kWh
DHW Heating COP	1.51	1.00	1.00
Annual DHW Heating Consumption	2,712 kWh	4,082 kWh	4,082 kWh
Annual Heating, Cooling, and DHW Consumption	7,936 kWh	12,410 kWh	11,954 kWh
Annual HRV Fan/Preheat Electricity Consumption	1,999 kWh	2,487 kWh	2,487 kWh
Annual Domestic Electricity Consumption	5,913 kWh	5,913 kWh	5,913 kWh
Total Annual Energy Consumption	<b>15,848 kWh</b>	<b>20,809 kWh</b>	<b>20,354 kWh</b>
Potential PV Electricity Annual Production	15,866 kWh	15,866 kWh	15,866 kWh
NZE Balance	18 kWh	-4,943 kWh	-4,488 kWh
Net Zero Energy Possible with Available Solar PV Area?	Yes	No	No
ASHP Heating/Cooling Equipment Cost	<b>\$8,600</b>	<b>\$8,200</b>	<b>\$8,500</b>
Ducting Cost (excl. ventilation)	<b>\$4,600</b>	-	-
Duct Heater Cost	<b>\$600</b>	-	-
Baseboard Equipment Cost	-	<b>\$1,020</b>	<b>\$1,020</b>
Estimated Major Equipment Capital Cost (excl. PV)	<b>\$13,800</b>	<b>\$9,220</b>	<b>\$9,520</b>
Cost per kwh	<b>0.05910</b>	<b>0.05910</b>	<b>0.05910</b>
Annual Operating Cost for Space Conditioning, DHW, HRV, and Domestic Electricity incl. PV Offset	<b>\$0</b>	<b>\$292</b>	<b>\$265</b>
20 Year Life Cycle Cost (Equip. + Op. Cost)	<b>\$13,800.00</b>	<b>\$15,063.19</b>	<b>\$14,824.95</b>

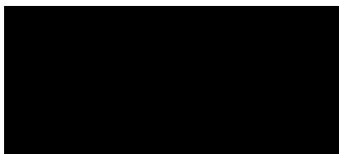
## CONCLUSIONS

Based on our analysis, our team recommends that the project pursue the proposed high-performance building envelope along with a ducted mini-split ASHP heating and cooling system with auxiliary electric resistant duct heater. The proposed building envelope and HVAC design achieve NZE performance, provide adequate air distribution to maintain occupant comfort, and has the lowest 20 year life cycle cost despite the greater upfront capital cost.

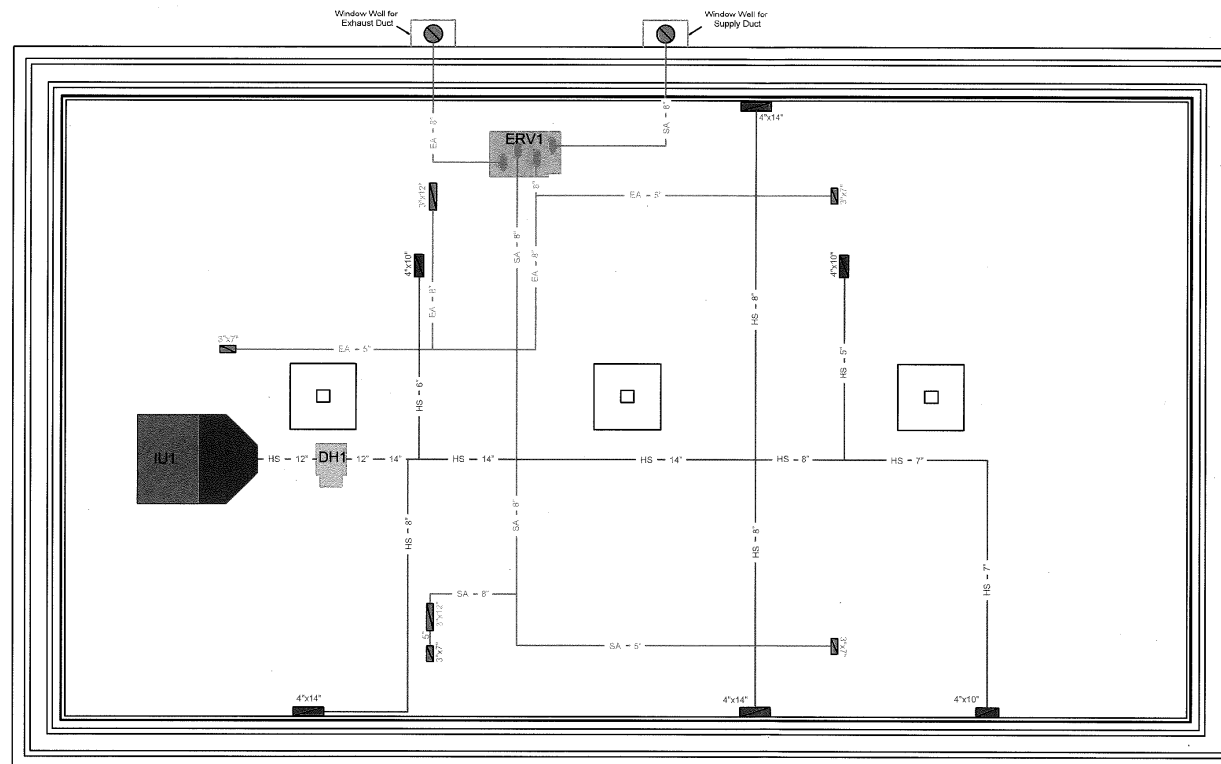
We trust the above analysis informs your design decisions. We're happy to discuss this information further to help optimize the home's design to meet your goals.

Sincerely,

RENÜ ENGINEERING INC.



Per: Kelly Fordice, P.Eng.  
Energy Engineer



**LEGEND:**

SV	Loc.	size	Supply Air Grille Tag
Loc.	Location (High Wall, Low Wall, Ceiling, Floor)		
Q	F		Fire Damper
B			Balancing Damper
			Air Grille
			Transfer Grille
			Duct Up
			Duct Down
HS			Heating Air Supply Duct
RA			Heating Air Return Duct
FA			Fresh Air Supply Duct
EA			Exhaust Air Duct
			Pipe Drop
			Pipe Rise
			Pump
HB			Non-Freeze Hose Bib
CO			Pipe Cleanout
			Floor Drain
			Fire Extinguisher
SS			Sanitary Drain - Below Slab
STM			Storm Drain - Below Slab
REF			Sanitary Drain Pipe
V			Sanitary Vent Pipe
STM			Storm Drain Pipe
COW			Dom. Cold Water Pipe
CHW			Dom. Hot Water Pipe
REF			Refrigerant Pipe
RAD			Radiant Pipe
			Control Wiring
T			Thermostat

**ReNü**  
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XX	2019.03.01	CORD. ISS.
XX	2019.02.14	CORD. ISS.
#	DATE	ISSUED FOR

**SEAL/PERMIT**

NOT FOR CONSTRUCTION

**PROJECT NO.**  
C18-652

**PROJECT**  
Eastmain Accessible Home

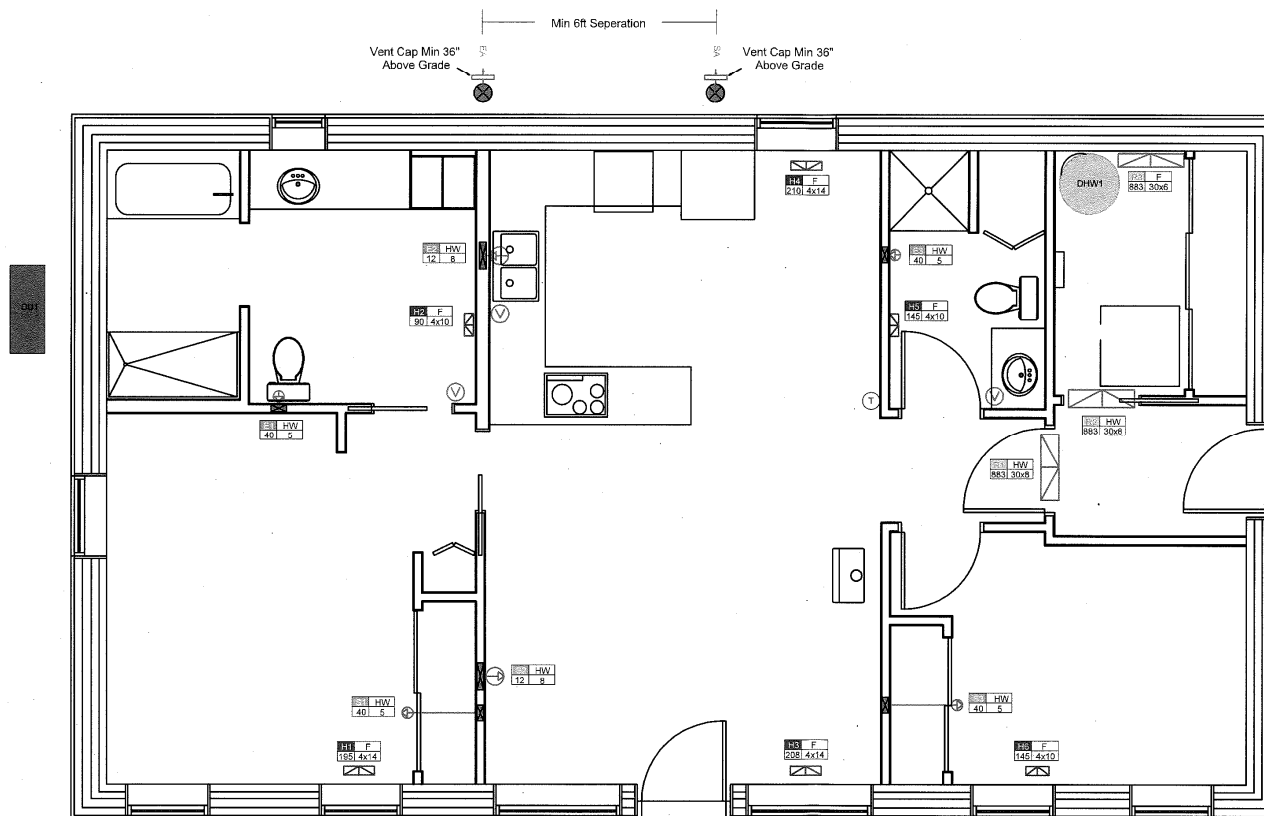
**LOCATION**  
Eastmain, QC

**DESCRIPTION**  
Crawl Space HVAC

**SHEET SIZE**  
ARCH B

**M1**

1  
M1 Crawl Space HVAC Layout  
Scale 1/4"=1' (1:48)



**LEGEND:**

SK	Loc.	Supply Air Grille Tag
cfm	size	

Loc. = Location (High Wall, Low Wall, Ceiling, Floor)

- Fire Damper
- Balancing Damper
- Air Grille
- Transfer Grille
- Duct Up
- Duct Down
- Heating Air Supply Duct
- Heating Air Return Duct
- Fresh Air Supply Duct
- Exhaust Air Duct
- Pipe Drop
- Pipe Rise
- Pump
- HB Non-Freeze Hose Bib
- CO Pipe Cleanout
- Floor Drain
- Fire Extinguisher
- SS SAN Sanitary Drain - Below Slab
- SS STM Storm Drain - Below Slab
- REF Sanitary Drain Pipe
- V Sanitary Vent Pipe
- STM Storm Drain Pipe
- DCW Dom. Cold Water Pipe
- DHW Dom. Hot Water Pipe
- REF Refrigerant Pipe
- RAD Radian Pipe
- Control Wiring
- Thermostat

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#	DATE	ISSUED FOR

**SEAL/PERMIT**

NOT FOR CONSTRUCTION

**PROJECT NO.**  
C18-652

**PROJECT**  
Eastmain Accessible Home

**LOCATION**  
Eastmain, QC

**DESCRIPTION**  
Main Floor HVAC

**SHEET SIZE**  
ARCH B

**M2**

1 Main Floor HVAC Layout  
M2 Scale 1/4"=1' (1:48)

HEATING, COOLING, AND VENTILATION EQUIPMENT SCHEDULE														
ID	QTY	Equipment	Location	Make	Model	Connected To	Notes	Electrical	Airflow (CFM)	E.S.P (in)	Heating Capacity (BTUH)	Cooling Capacity (BTUH)	Dimensions	Weight (lbs)
ERV1	1	Energy Recovery Ventilator	Crawl Space	VanEE	G2400EE ECM	-	c/w (2) 8" outdoor hoods	120V, 2.2 A	210	0.4	-	-	33" L x 21" W x 34" H	108
IU1	1	ASHP Indoor Unit	Crawl Space	Mitsubishi	PEAD-A30AA7	OU1		MCA 2.73A	883	0.6	32,000 @ 5°F	27,000	44" L x 29" W x 10" H	69
OU1	1	ASHP Outdoor Unit	Outside	Mitsubishi	PUZ-HA30NHA5	IU1		MCA 28A, Breaker Size 30A	-	-	32,000 @ 5°F	27,000	38" L x 15" W x 54" H	265
DH1	1	Duct Heater Unit	Crawl Space	Stelpro	SDHR12080002	IU1		240V	Min 50/kw	-	27,000	-	14" L x 20" W x 14" H	23
DWH1	1	ASHP Hot Water Heater	Storage Room	AO Smith	HPTU-66N	-	66 Gallon	208/240V, Breaker Size 30A	-	-	-	-	61" H, 27" Diam.	289

GRILLE / DIFFUSER SCHEDULE					
Tag	QTY	Manufacturer	Grille / Diffuser Description	Design Capacity (CFM)	Applicable Notes:
H2, H5, H6	3	Imperial	Floor Register - RG0247 - 4"x10"	40-160	
H1, H3, H4	3	Imperial	Floor Register - RG0283 - 4"x14"	80-240	
R1, R2	2	Imperial	Sidewall Grille - RG05S0 - 30"x8"	400-1100	2
R3	1	Imperial	Floor Grille - RG1166 - 30"x6"	300-1400	2
S1, S3, E1, E3	4	Primex	Ceiling and Sidewall Diffuser - 5" - WGX5	40-162	
S2, E2	2	Primex	Ceiling and Sidewall Diffuser - 8" - WGX7	90-355	1

# NOTES:

- KITCHEN EXHAUST DIFFUSER, INSTALL ROUND GREASE FILTER BEHIND GRILLE (IMPERIAL DR-06 OR EQUIVALENT)
- CLIENT TO SPECIFY GRILLE FINISH

LEGEND:	
	Supply Air Grille Tag
	Loc. = Location (High Wall, Low Wall, Ceiling, Floor)
	Fire Damper
	Balancing Damper
	Air Grille
	Transfer Grille
	Duct Up
	Duct Down
	Heating Air Supply Duct
	Heating Air Return Duct
	Fresh Air Supply Duct
	Exhaust Air Duct
	Pipe Drop
	Pipe Rise
	Pump
	Non-Freeze Hose Bib
	Pipe Cleanout
	Floor Drain
	Fire Extinguisher
	SS SAN Sanitary Drain - Below Slab
	SS STM Storm Drain - Below Slab
	REF Sanitary Drain Pipe
	V Sanitary Vent Pipe
	STM Storm Drain Pipe
	COW Cold Water Pipe
	CHW Hot Water Pipe
	REF Refrigerant Pipe
	RAD Radon Pipe
	Control Wiring
	Thermostat

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XX	2019.02.14	CORD, ISS.
#	DATE	ISSUED FOR

SEAL/PERMIT

NOT FOR CONSTRUCTION

PROJECT NO.  
C18-652

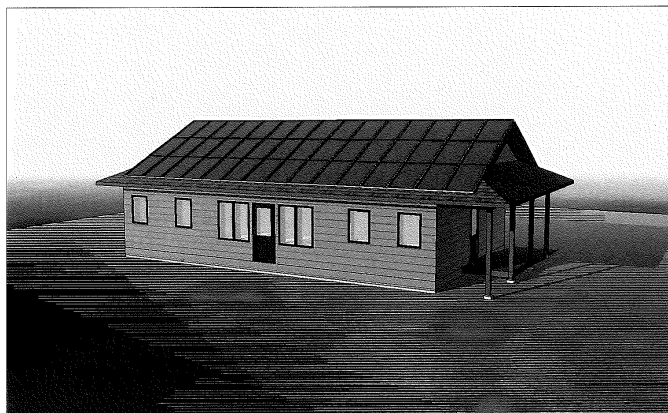
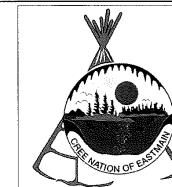
PROJECT  
Eastmain Accessible Home

LOCATION  
Eastmain, QC

DESCRIPTION  
Scheds + Specs

SHEET SIZE  
ARCH B

M3



DRAWING LIST:  
A-1 BASEMENT & GROUND FLOOR PLANS  
A-2 ROOF PLAN  
A-3 ELEVATIONS  
A-4 PARTIAL INTERIOR ELEVATIONS  
A-5 BUILDING SECTION  
A-6 WALL SECTION & SCHEDULES  
E-1 ELECTRICAL LAY-OUT



GENERAL NOTES:  
 1- ALL DIMENSIONS ARE TAKEN FROM FACE OF STUDS  
 2- ALL CLOSET WALLS IN BATHROOMS TO BE WOODPLATE RESISTANT

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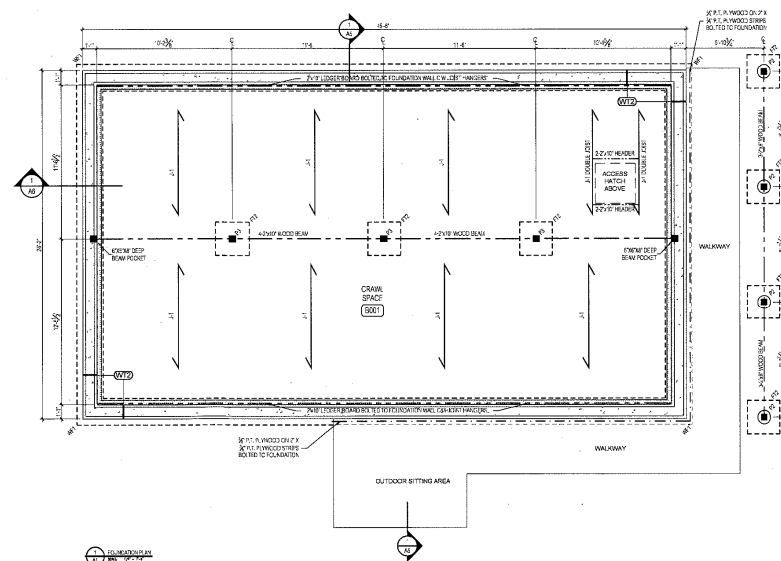
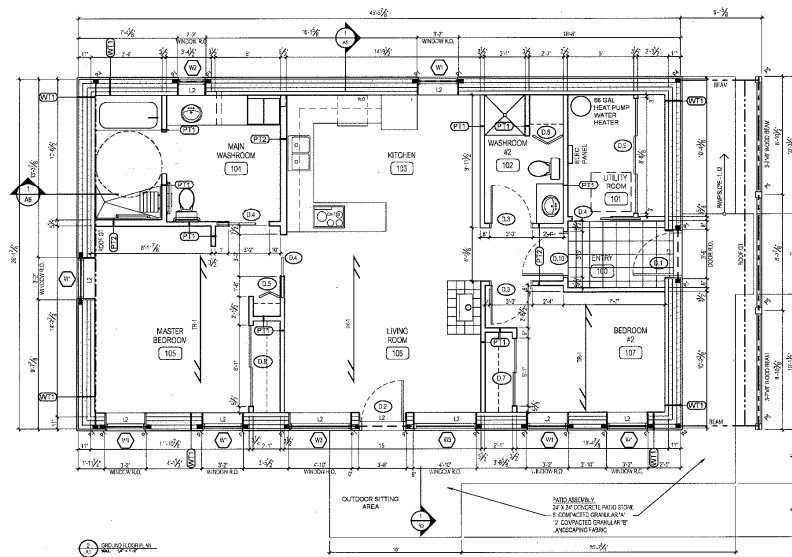
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**MOSES ACCESSIBLE HOUSE**  
 EASTMAIN QUEBEC

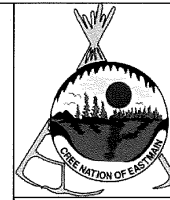
drawing name  
 BASEMENT & GROUND FLOOR PLANS

designed by  
 W. SIMPSON - NORDIC Consulting & Design  
 drawn by  
 RAND

approved by  
 [Signature]  
 date  
 JANUARY 30/18  
 scale  
 1/8" = 1'-0"

project no.  
 sheet no.  
**A-1**





ORIGINAL NOTES:  
 1- ALL DIMENSIONS MET FROM FACE OF STUD.  
 2- ALL DRYWALL IS WAS-HOODS TO BE MOISTURE RESISTANT

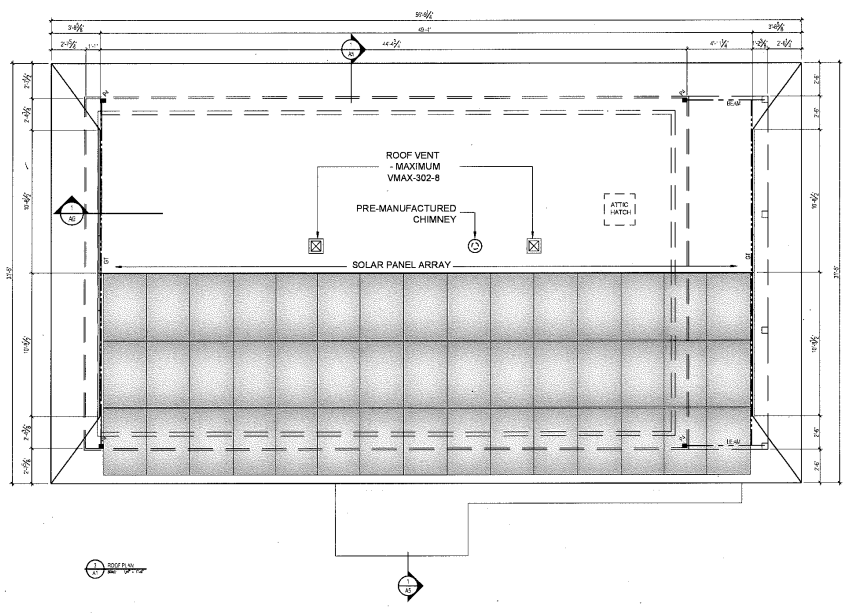
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1	CONSTRUCTION JAN 17 2013
no	description & author date
project north	true north

project name  
**MOSES ACCESSIBLE HOUSE**  
 EASTMAIN QUEBEC

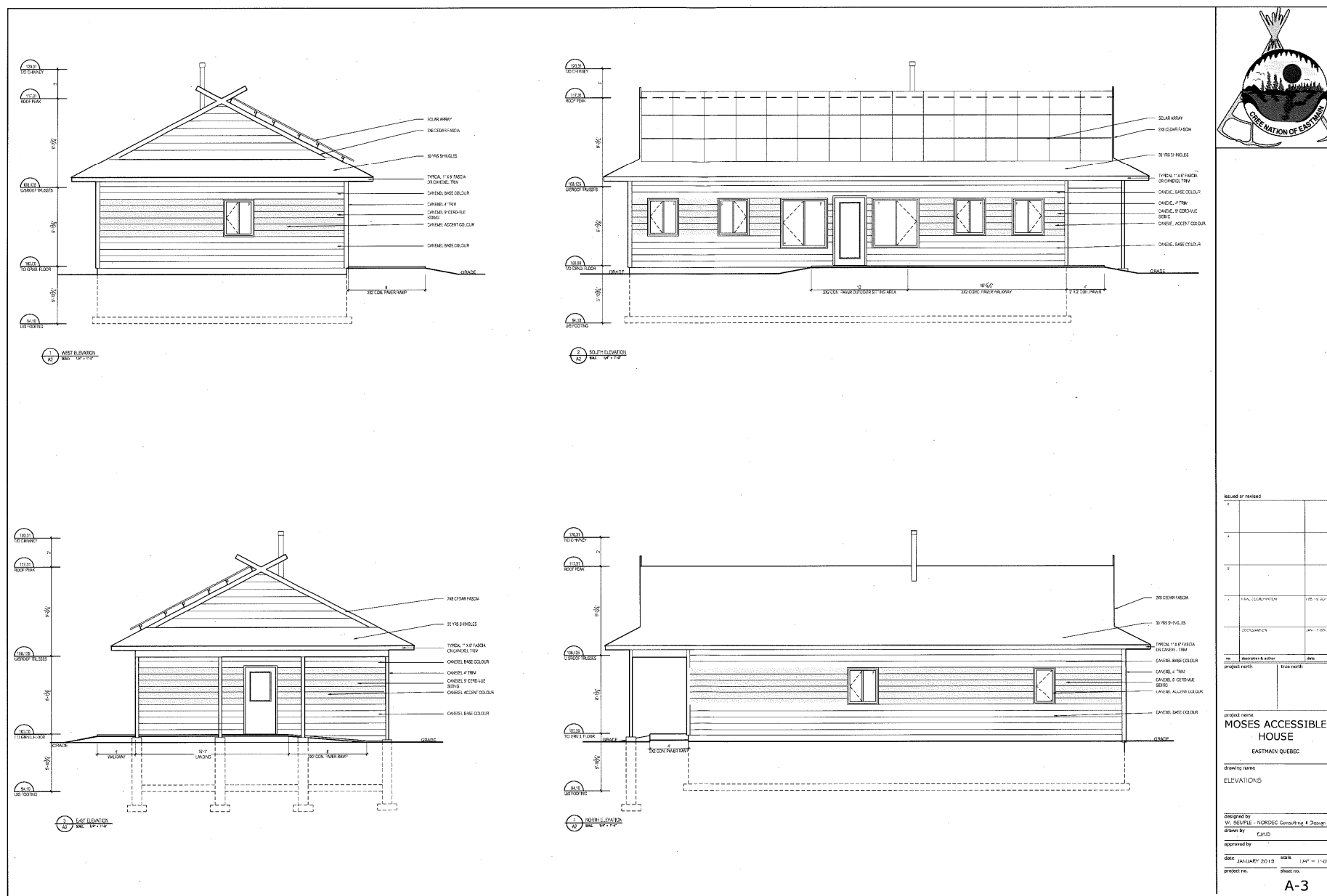
drawing name  
 ROOF PLANS

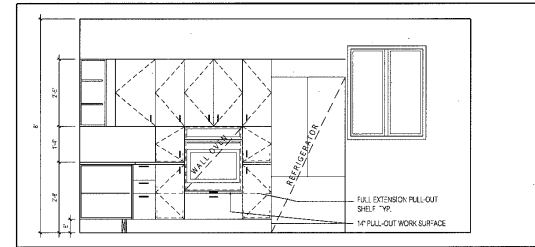
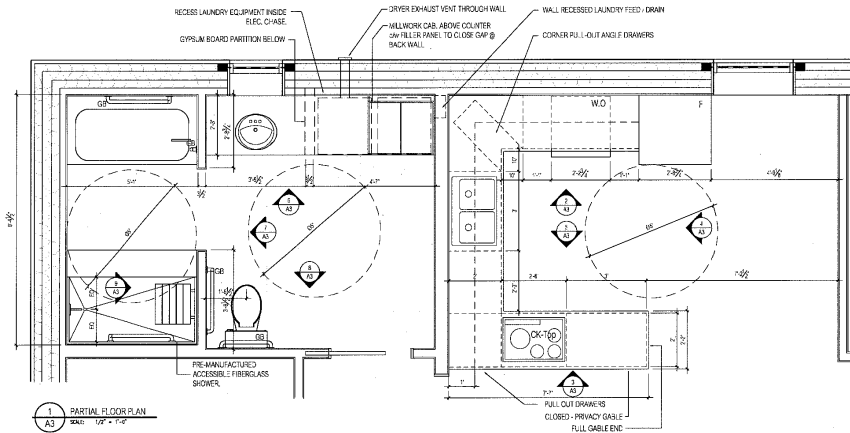
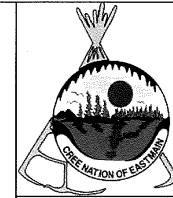
designed by  
 V. SCHUPPE - NORDIC Consulting & Design  
 drawn by  
 E.L.H.D.  
 approved by  
 date  
 JANUARY 2013  
 project no.  
 sheet no.

A-2

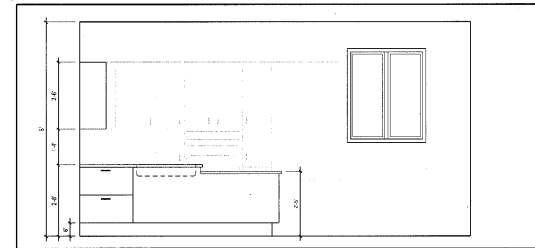




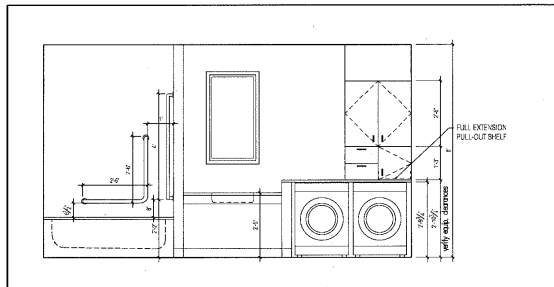




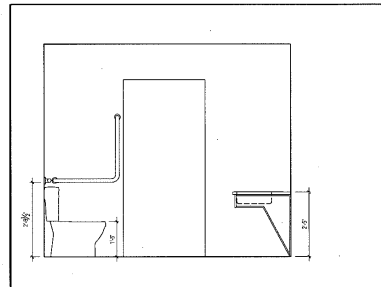
2 KITCHEN ELEVATION  
SCALE: 1/2" = 1'-0"



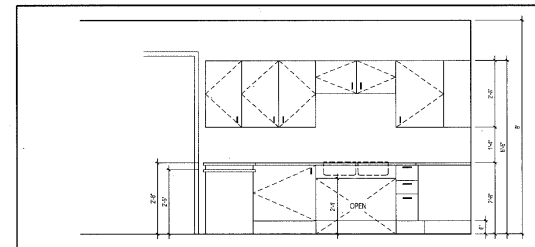
3 KITCHEN ELEVATION  
SCALE: 1/2" = 1'-0"



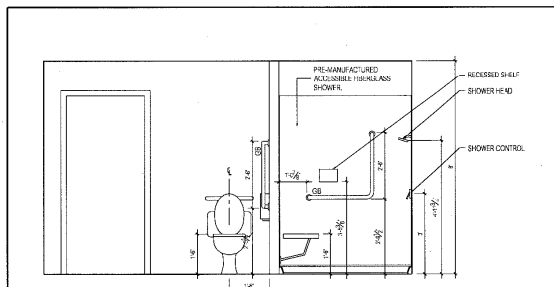
6 WASHROOM ELEVATION  
SCALE: 1/2" = 1'-0"



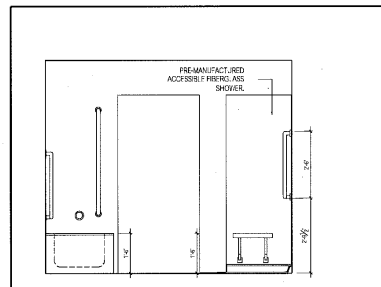
7 WASHROOM ELEVATION  
SCALE: 1/2" = 1'-0"



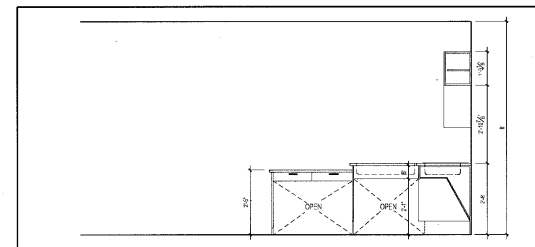
4 KITCHEN ELEVATION  
SCALE: 1/2" = 1'-0"



8 WASHROOM ELEVATION  
SCALE: 1/2" = 1'-0"



9 WASHROOM ELEVATION  
SCALE: 1/2" = 1'-0"



5 KITCHEN ELEVATION  
SCALE: 1/2" = 1'-0"

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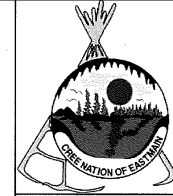
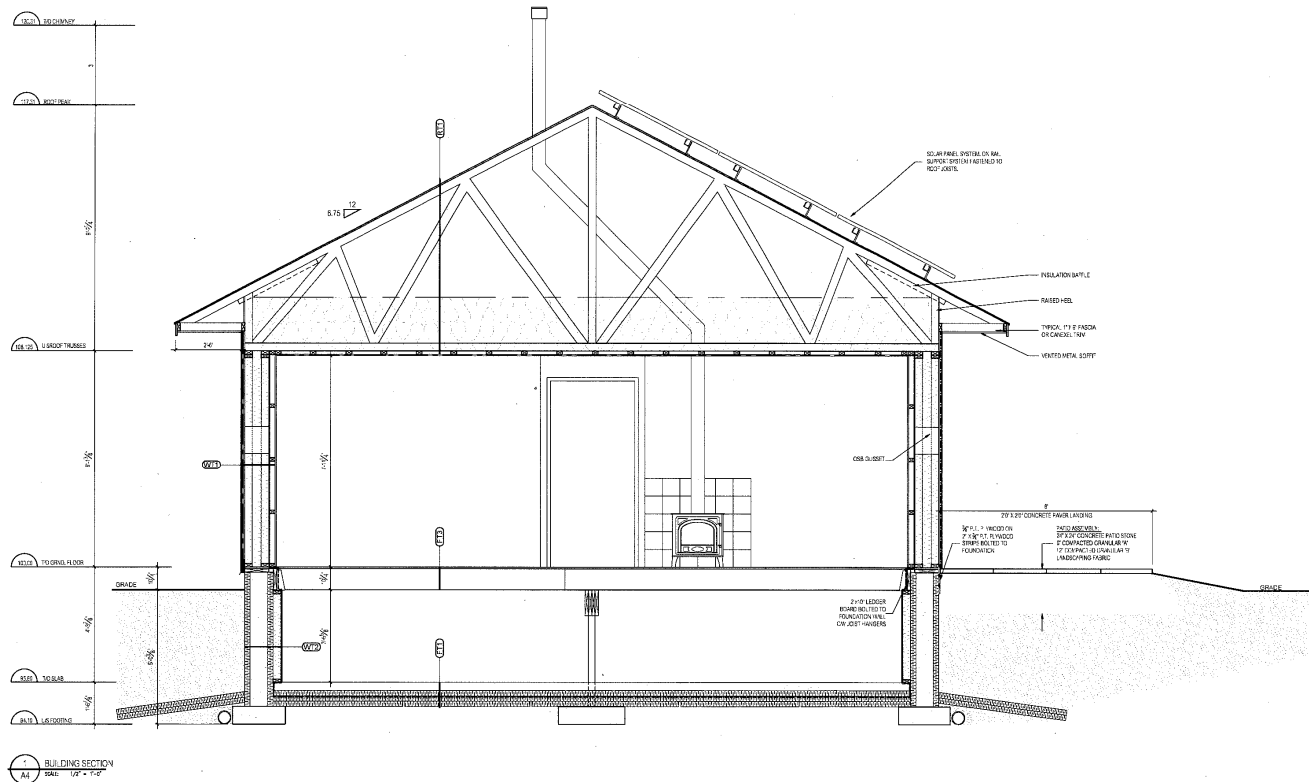
project name  
**MOSES ACCESSIBLE HOUSE**  
EASTMAIN QUEBEC

drawing name  
**WASHROOM & KITCHEN PLANS AND ELEVATIONS**

designed by  
W. SEMPLE - NORDEC Consulting + Design  
drawn by  
ELMD

approved by  
date JANUARY 2019 scale 1/2" = 1'-0"  
project no. sheet no.

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project name  
**MOSES ACCESSIBLE HOUSE**  
 EASTMAIN QUEBEC

drawing name  
 BUILDING SECTION

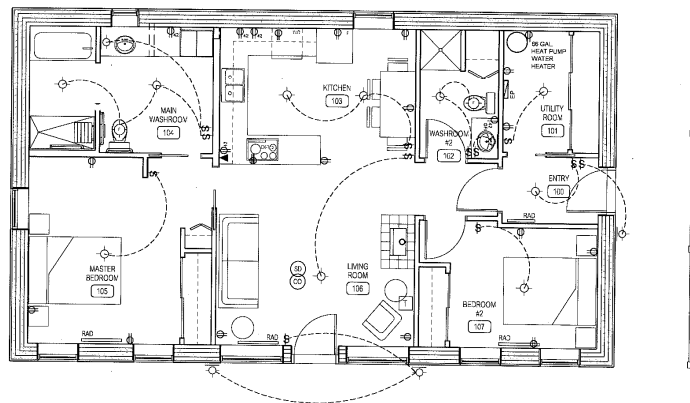
designed by  
 W. DEMPSEY - HOKOEC Consulting & Design  
 drawn by  
 JAYD

approved by

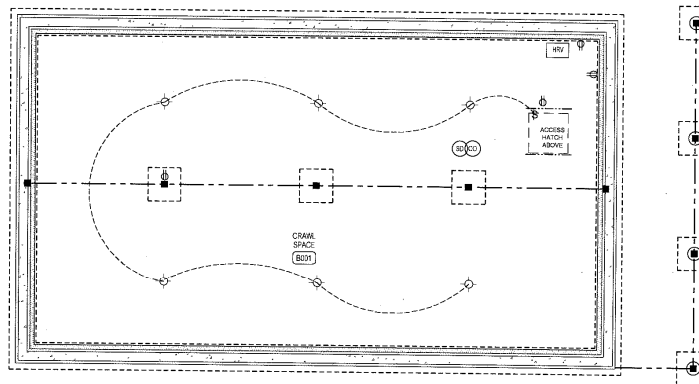
date JANUARY 30/9 scale 1/2" = 1'-0"  
 project no. sheet no.

A-5





1.1. SECOND FLOOR ELECTRICAL PLAN  
NO. 100-104



1.2. CRAWLSPACE ELECTRICAL PLAN  
NO. 100-104

SYMBOL	DESCRIPTION
	SINGLE POLE SWITCH
	THREE WAY SWITCH
	DIMMER SWITCH
	DUPLEX ELECTRICAL RECEPTACLE (15 AMP, 120 VAC)
	200V ELECTRICAL RECEPTACLE
	GROUND FAULT CIRCUIT INTERRUPTER (GFCI) ELECT. RECEPTACLE (100 AMP)
	THERMOSTAT
	TELEPHONE JACK
	ELECTRICAL PANEL
	BASEBOARD RADIATOR
	WALL MOUNTED LIGHT FIXTURE
	CEILING LIGHT FIXTURE
	NEW EXHAUST FAN
	NEW INTERCONNECTED AC SMOKE DETECTOR
	NEW INTERCONNECTED AC CARBON MONOXIDE DETECTOR
	NEW HEAT RECOVERY VENTILATION SYSTEM MODEL TO BE CONFIRMED



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project name  
**MOSES ACCESSIBLE HOUSE**  
EASTMAIN QUEBEC

drawing name  
**ELECTRICAL PLANS**

designed by  
W. ADAM, P. ENG. / HCD/EC Consulting & Design  
drawn by  
EJAD  
approved by  
date  
JANUARY 2018  
project no.  
1/21 - 1/21

E-1

Canada Mortgage and Housing Corporation  
Société canadienne d'hypothèques et de logement



cmhc.ca

December 13, 2018

Mr. Stanley Gilpin  
Cree Nation of Eastmain  
151 Nouchimi Street  
Eastmain, QC  
J0M 1W0

**Subject:** Research and Planning Fund: Notice of decision on your proposal "Improving community well-being through housing" (Ref # 9230718).

Dear Mr. Gilpin,

I am pleased to inform you that your proposal to conduct the research project "Improving community well-being through housing" has been selected for funding under the National Housing Strategy (NHS) Research and Planning Fund.

CMHC would like to congratulate you and your project team on your successful proposal. Your proposal was determined to be comprehensive and detailed, and reflective of the priority areas and priority populations of the National Housing Strategy.

A representative of the Housing Needs Research team will be contacting you shortly with details on the next steps, including finalizing your project's plan, funding and the contribution agreement with CMHC. Please note that while CMHC looks forward to supporting your project, funding is contingent on finalizing a contribution agreement between your organization and CMHC. Hence, no announcement or communication can be made regarding CMHC funding or support for the project prior to the signing of a Contribution Agreement by both parties. If you have any questions, please do not hesitate to contact us at [Innovation-Research@cmhc-schl.gc.ca](mailto:Innovation-Research@cmhc-schl.gc.ca)

CMHC looks forward to successfully concluding an agreement to support your project.

Sincerely,

Kathleen Worton, PhD  
Researcher, Housing Needs  
Canada Mortgage and Housing Corporation (CMHC)



March 5, 2019

Smart Cities Challenge  
Finalist Jury

**RE: Letter of Support from Center for Zero Energy Building Studies (CZEBS) as a Partner in Cree Nation of Eastmain Smart Cities Challenge application**

Dear Sir/Madam;

As the Director of the Centre for Zero Energy Building Studies (CZEBS), it is my great pleasure to express our strong support to the Cree Nation of Eastmain's application to the Smart Cities Challenge. The Centre for Zero Energy Building Studies (CZEBS) at Concordia University is one of the leading research institutes on net zero energy buildings in Canada and worldwide. We have led two NSERC Strategic Networks (myself as Scientific Director) - the NSERC Solar Buildings Research Network (SBRN, 2005-2010) and NSERC Smart Net-zero Energy Buildings Strategic Research Network (SNEBRN, 2011-2016). Now we are also leading the 3<sup>rd</sup> NSERC Strategic Network Smart Solar Buildings and Communities under review (SSBC, 2019-2024). Our Centre is known across Canada and internationally for our work on smart net zero energy buildings, energy efficiency and advanced building envelopes. Through our extensive work in this area, Concordia has built significant capacity with seven faculty members, including Dr. Hua Ge who is a Theme co-leader in SSBC and over 50 graduate students specializing in zero energy/solar buildings, advanced building envelopes and integration of smart technologies such as predictive controls.

With the housing challenges that exist in northern Indigenous communities, the CZEBS recognizes the significance of Eastmain's Net Zero Energy Housing Program, as it addresses issues of housing performance, resilience and durability as well as issues of culture and design. In addition to the significance the program will have to the community of Eastmain, the Centre for Zero Energy Building Studies views the Cree Nation of Eastmain's Net Zero Housing Program as a significant and timely northern research initiative with the potential to advance net and near net zero energy housing in Indigenous and non-Indigenous northern communities. It is significant that the CNE's Net Zero Housing Program aligns with and supports the Government of Canada's initiative to have a near net zero building code established by the year 2030. The CNE's Net Zero Housing Program fits well with the NSERC SSBC Network's goal to develop and advance technologies for smart and resilient solar buildings and communities, thus contributing to the substantial long-term environmental benefits through dramatic reductions in GHG emissions.

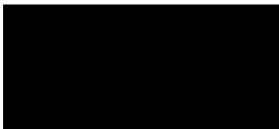
As a partner, Concordia's research team will carry out research on field monitoring of the houses proposed in CNE's application including the single family Access house to be built in June 2019 and the six-complex houses, and 5 retrofit buildings. Concordia researchers will instrument these buildings, collect and analyze data, evaluate the NZE building performance in terms of energy, hygrothermal performance, indoor thermal comfort and indoor air quality. The data collected, analyzed and performance evaluated will help refine and optimize the design to ensure high performance, net-zero status at low-cost and low-maintenance. Design best practices and guidelines appropriate for northern

communities can be developed through these research efforts and partnership with SSBC. This model can be scaled and implemented to other indigenous communities to solve the urgent housing issues faced in these communities.

We would like to make a commitment of \$25k for purchasing monitoring equipment and \$50k for supporting graduate students who conduct research over the next three years through NSERC SSBC network. We strongly believe that this partnership between CZEBs through NSERC SSBC Network and CNE will help achieve the goal of both NSERC SSBC network and the CNE NZE Housing program's long-term goal as a sustainable and healthy community.

We look forward to a productive collaboration with great benefits to Canada.

Sincerely,



Andreas K. Athienitis, Eng., PhD, FCAE, FIBPSA, FASHRAE  
NSERC/Hydro Quebec Industrial Chair & Concordia Research Chair  
Scientific Director, NSERC Smart Net-zero Energy Buildings Strategic Research  
Network & Director, Concordia Centre for Zero Energy Building Studies (CZEBS)  
Dept. of Building, Civil and Environmental Engineering, Concordia University, 1455 Maisonneuve W.  
<https://www.concordia.ca/research/zero-energy-building.html>  
<http://www.solarbuildings.ca>  
email: [aathieni@encs.concordia.ca](mailto:aathieni@encs.concordia.ca)  
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Stanley Gilpin  
Housing Director  
Cree Nation of Eastmain  
151 Nouchimi Meskino  
Eastmain, QC  
J0M 1W0

ATIA - 19(1)

September 17, 2018

**Re: Support to the project *Improving community well-being through housing***

Dear Mr Gilpin,

It is great enthusiasm that I am collaborating to the research proposal "Improving community well-being through housing". In my role as Canada Research Chair in Housing, Community and Health at McGill University, I lead an interdisciplinary research group assessing the health and well-being impacts of housing and community development project on health and well-being at the individual, family, and community level.

Over the past seven years, I have led research projects addressing this topic in Inuit communities in Nunavik and Nunavut, and in the Cree Nation of Nemaska. I have expertise in conceptualizing these projects, in collecting data using various methodologies, and presenting results back to the communities and organizations I am working with.

In this project, I would provide the scientific expertise to realize this project, and would supervise the proposed dedicated researcher, [REDACTED] who would fully execute the scientific aspects of the proposal. [REDACTED] would further train local research assistants in housing-related research and in using a range of methodological skills.



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Montreal, QC Canada H3A 1A3

In terms of in-kind contribution to the project, my time commitment in overseeing the scientific aspects of the proposal will be equivalent to [REDACTED] hours/week for the one-year period of the proposal (~[REDACTED] salary). I will also provide a workspace and computer to [REDACTED]

ATIA - 19(1)

Sincerely,

[REDACTED]

**Mylene Riva**

Canada Research Chair in Housing, Community, and Health  
Assistant Professor, Institute for Health and Social Policy & Department of Geography, McGill University

**Mailing address:**

Institute for Health and Social Policy, McGill University  
Charles Meredith House  
1130 Pine Avenue West  
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Email: mylene.riva@mcgill.ca

**Page(s) 184 to 193  
are withheld  
pursuant to paragraph  
19(1)  
of the *Access to Information Act***

**\*\*\*\***

**La/les page(s) 184 à 193  
Font l'objet d'une exception totale  
conformément aux dispositions de paragraphe  
19(1)  
de la *loi sur l'accès à l'information***

## PRIVACY IMPACT ASSESSMENT

<b>PROJECT</b>	Net Energy Zero Housing Project
<b>ORGANIZATION</b>	Cree Nation of Eastmain
<b>PROJECT LEAD</b>	Director General

### 1. BACKGROUND

The Cree Nation of Eastmain (CNE) is a finalist in the Smart Cities Challenge. It proposed to create a Net Zero Energy housing program to respond to its critical housing shortage. As part of its proposal, the CNE must consider the privacy implications and its plans for ensuring privacy compliance.

Eastmain is located in Northern Quebec along the eastern shore of the James Bay.

### 2. LEGISLATIVE AUTHORITY

The CNE is a Cree First Nation. Pursuant to the *Agreement on Cree Nation Governance Between the Crees of Eeyou Istchee and the Government of Canada*, the CNE acts as a local government authority in Eastmain. It administers the assets of the First Nation, manages the land and the buildings and establishes, delivers and administers programs and services for members.

An important program operated by the CNE is housing. The CNE constructs housing to rent to members and obtains loans through Canada Mortgage and Housing Corporation for social housing. In order to address the severe housing shortage, the CNE intends to establish a program that offers affordable private homeownership and rental housing and addresses some of the issues facing on-reserve housing.

The Agreement concerning a *New Relationship between the Government of Canada and the Cree of Eeyou Istchee* first addressed housing in the Cree communities. This agreement confirmed the powers of the First Nations to adopt by-laws with respect to housing.

Under the *Agreement on Cree Nation Governance Between the Crees of Eeyou Istchee and the Government of Canada*, the Cree Nation government receives and distributes funding paid to the CNE pursuant to the *James Bay and Northern Quebec Agreement*. As such, the criteria and information requirements of the NZE housing program are designed to comply with the Cree Nation Government's criteria for housing as non-compliance with such criteria will impact the CNE's eligibility for funding for housing.

The CNE is in the process of implementing an integrated management system auditable to ISO Standards; 9001:2015 Quality Management; 20000-1:2011 Information Technology Service Management; and 27001:2013 Information Security Management. It is therefore alive to the need for rigorous information and data management protocols that ensure personal and confidential information are properly collected, managed and stored.

### 3. PROJECT DESCRIPTION

The Net Zero Energy (NZE) housing program focusses on the construction of new single-family and multi-unit homes and retrofitting existing homes. The NZE housing program will complement the existing rental and social housing programs.

Key personal information will be collected to ensure that housing is allocated appropriately, reflects the needs of its members and their financial capacity.

In addition, the CNE has already conducted an inspection of existing homes to identify deficiencies. This information will be used to determine the homes that are suitable for renovations and NZE retrofitting. The information respecting these homes is relevant for determining which ones will qualify for retrofitting.

The NZE housing program will involve the participation of other organizations. These organizations are: (a) Concordia University and (b) McGill University. In addition, the CNE will engage engineering firms and contract with suppliers for the purposes of carrying out construction or retrofitting of the homes.

### 4. PROJECT ACTIVITIES

The NZE housing program will involve the collection, use and storage of various types of data.

#### *Rental Housing*

The CNE collects the information described below during the housing application process. All of the information is provided directly by the applicant or is obtained with the consent of the applicant. The information is collected solely for the purposes of administering the rental housing program (*Risk level 2*) and evaluating and prioritizing the housing application.

Information	Purpose	Risk
Name of applicant(s)	Identification	1
Status/Membership	Contractual obligation that social housing be attributed to members	1
Family size	Determine housing needs	1
Total household income	Determine rent	3
Health conditions	Determine special housing needs	3
Rental arrears	Determine eligibility for new housing	3
Credit rating	Verify capacity to pay	3

The CNE is required by the policies of the Cree Nation Government to collect and use certain personal information when allocating rental housing. Social housing is geared toward the financial capacity of occupants and is intended for lower income families.

The above information is collected by the Rental Housing Department (the "Department") when the member completes an application for rental housing and consents to a credit

check. The information collected is used solely for the purposes of evaluating the applicant's request for housing and determining the applicant's capacity to pay.

#### *Private Homeownership*

Information	Purpose	Risk
Name of applicant(s)	Identification	1
Status/Membership	Contractual obligation that social housing be attributed to members	2
Family size	Determine housing needs	2
Loan information	Confirm ability to pay for the construction of house	3
Health conditions	Determine special housing needs	3
Rental arrears	Determine eligibility under policies	3
Credit rating	Verify capacity to pay	3

In order to purchase or construct a home, members must comply with CNE policies and Cree Nation Government policies governing the private homeownership program. This program enables members to obtain grants to assist with the construction. The CNE will be required to be informed of financing arrangements with financial institutions because these institutions often require the Cree First Nations to guarantee loans to their members.

The information collected from private homeownership applicants will be used solely for the purposes of administering this program and evaluating eligibility of the applicants.

Homes built under the private homeownership program will be subject to contracts between the homeowner and the builder. The CNE will be required to collect the below business information in order to ensure that builders qualify under the Cree Nation Government policies.

Information	Purpose	Risk
Business Name	Identification	1
Ownership	Policy requirement	1
Operational Structure	Policy requirement	1
Regie du batiment licence	Verify qualifications	1
Financial information	Confirm financial ability to build houses	3
Debts with CNE	Determine eligibility under policies	3

Many of the local builders are sole proprietorships or partnerships with few incorporated companies. All the information is collected directly from the builders or from third parties with their consent. Certain information is publicly available because of reporting requirements under Quebec law.

The above information is collected solely to determine builders' eligibility to construct homes under the private homeownership program.

### *Retrofitting*

The CNE intends to retrofit existing qualified homes to make these more energy-efficient. Retrofitting work may be done in-house by the Department or contracted out to local builders. There will be no exchange of personal information. Generally, the retrofitting work on existing homes will require limited entry into homes or contact with occupants as most work will be carried out on the exterior.

### *Partners*

CNE is working with Concordia University and McGill University to measure the success of the NZE housing program. Concordia University will collect and analyse quantitative data while McGill University will collect and analyse qualitative data. Both partners are subject to their respective privacy policies and protocols (*Risk Scale 1*).

#### Concordia University

Concordia University will carry out field monitoring and detailed modelling with respect to the NZE homes and retrofits in Eastmain.

The performance data will enable Concordia University and CNE to validate performance and improve the design, construction and operation of NZE homes. The field data will be collected for the purpose of measuring the actual net-zero energy of the houses and how occupants interact with and operate their NZE homes. The information collected is identified below and will not be used to make decisions about an identifiable individual (*Risk Scale 1*).

Information	Purpose	Risk
Address	Identification	1
Hygrothermal Performance	Research	1
Electricity Consumption	Research	1
Energy Performance	Research	1
Indoor Air Quality	Research	1
Thermal Conditions	Research	1
Energy Generation	Research	1

Information respecting indoor environmental quality will be shared with McGill University to assist in the qualitative analysis.

#### McGill University

McGill University will be conducting a qualitative study to determine the level of satisfaction of the occupants of NZE homes. McGill University will collect the information identified below directly from occupants except for certain quantitative data relating to the NZE homes that will be provided by Concordia University.

The information will be collected for research purposes and to determine the success of the NZE housing program from a social perspective. The information collected will not be used

to make decisions affecting identifiable individuals (*Risk Scale 1*) but will assist the CNE in improving its NZE housing program.

Information	Purpose	Risk
Name	Identification	1
Family Size	Research	1
Address	Identification	1
House Model/Size	Research	1
Comfort	Research	2
Satisfaction	Research	1

The information collected by McGill University will be anonymized before being used for research purposes and before it is disclosed to any third parties in reports on the social success of the NZE housing program.

## 5. TERM

The NZE housing program is intended as a long-term program (*Risk Scale 3*). Data collection activities will be carried out throughout part of the program in order to measure success, identify concerns and deficiencies and adjust the program accordingly.

## 6. POPULATION

The information collection and use activities of the CNE NZE housing program will be limited to CNE members.

The personal information collected by the CNE will be used internally to administer its housing program. The information will be used to make decisions respecting the allocation of rental housing and the approval of grants for private homeownership. The information will therefore affect every applicant for rental housing or private homeownership (*Risk Scale 3*).

No personally identifiable information will be used or disclosed by Concordia University or McGill University. Reports prepared by the CNE and its partners on the success and details of the NZE housing program will be anonymized or will focus on technical aspects of the program.

## 7. TECHNOLOGY

The CNE recently made changes to its information technology system to ensure better functioning and security. The implementation of the NZE housing program will not require the introduction of new information technologies or software to support the collection, use or storage of personal information.

However, the NZE houses will be equipped with connective technology allowing Concordia University to monitor and measure field data and performance data. Moreover, most homes



are already equipped with smart meters that provide accurate and up-to-date information on energy use.

## **8. INFORMATION TRANSMISSION**

CNE, Concordia University and McGill University will collect, use and store information in different ways.

### *Cree Nation of Eastmain*

Certain information about members is already maintained on the CNE information system including

- (a) name,
- (b) band number,
- (c) date of birth, and
- (d) address.

This information is required to access funding, ensure members can access programs and services offered by the CNE and by other Cree entities. The CNE information system is connected to the internet but the personal information is not shared electronically with any third party (*Risk Scale 2*).

The CNE uses paper application forms that members complete and submit to the Department (*Risk Scale 1*). The forms are kept in a secure place in the Department and the information is accessed solely for the purposes of allocating rental units and under the NZE housing program will be used also to process applications under the private homeownership program.

The CNE will not disclose information it collects to any third party except as required by law or policy. Only information relating to the addresses of NZE homes will be disclosed by the CNE to its partners, Concordia University and McGill University.

### *Concordia University*

Concordia University will receive the personal information identified in section 4 electronically through connective technologies and this information will be analysed within its information system (*Risk Scale 2*). Other than the house address, no other personally identifiable information will be transmitted.

The information obtained and used by Concordia University will not permit the identification of an individual.

### *McGill University*

McGill University will collect data directly from individuals at meetings, talking circles and other forums. The information collected will be used and stored on a closed system that has no connectivity to the internet or other systems (*Risk Scale 1*).

Prior to any reporting, the information obtained by McGill University will be anonymized to prevent the identification of those individuals who participate in the forums.

## **9. RISKS**

It is unlikely that a privacy breach in respect of the information collected by Concordia University or McGill University would impact the individuals concerned by the information.

A privacy breach of CNE-held information could impact the individual concerned by that information.

In the event of unauthorized or accidental disclosure or access, the CNE will notify the affected individual(s) and make efforts to mitigate the privacy breach by ensuring the employees responsible are given proper training and information in order to prevent future privacy breaches. Employees who intentionally access or disclose personal information may also be subject to disciplinary measures, such as suspension or termination, under CNE policies.

The CNE is also preparing policies respecting the classification of information and identifying the levels of access and protection required. Employees will be trained on these policies to ensure that information is treated according to its nature and degree of confidentiality.

## **10. ANALYSIS**

The NZE housing program will involve the collection, use and retention of personal information, of varying degrees of sensitivity. The CNE intends to comply with fair information principles.

### *Accountability*

Pursuant to the *Agreement on Cree Nation Governance Between the Crees of Eeyou Istchee and the Government of Canada* and the *Constitution of the Cree Nation of Eeyou Istchee*, the CNE must establish access to information procedures with respect to information in its control. The CNE is implementing a process for classifying information and establishing the level of protection required.

Presently, CNE agreements contain provisions respecting confidentiality and, with respect to service providers, retention and disclosure restrictions.

With respect to the NZE housing program, information collected by Concordia University and McGill University will be held by those institutions. CNE will only receive the results of the studies conducted by its partners which will not contain information allowing the identification of an individual.

### *Purpose*

The CNE has held public meetings with its members in designing the NZE housing program. As well, housing continues to be tabled at public meetings. Members are informed regularly of the information requirements for housing. The new regional policies will be coming into

force and the NZE housing program will involve further consultation with members. At these meetings, the CNE will inform members of the type of information that will be required and the purpose.

Prior to all collection of information, the individual is informed of the reasons for which the information is collected, how it will be used and whether it will be shared with other organizations.

#### *Consent*

The CNE collects and holds information relating to members under other programs. Unless the member consents to its disclosure to the Department, the CNE must request that information directly from the individual. As such, the CNE only uses personal information for the purposes for which it was originally obtained.

The name and address of the individual as well as information relating to membership are generally publicly known given the size of Eastmain. While the CNE may have a general understanding of certain health conditions, this information must be obtained directly from the individual or, if incapable, from that individual's caregiver.

#### *Limit Collection*

The information collected by the CNE will be that information required for the purposes of administering the NZE housing program and complying with the CNE housing policies and the policies to be adopted by the Cree Nation Government.

The information collected by Concordia University and McGill University is necessary to enable the analysis of the net-zero energy technologies, construction systems and to measure the success and individual satisfaction with the NZE homes to be built in Eastmain.

#### *Limit Use, Disclosure and Retention*

The information collected by the CNE will be used exclusively for the purposes of administering its housing program. The information collected will not be disclosed to third parties except as required by policy. Disclosure to the Cree Nation Government may be required under its policies and funding arrangements with the CNE. Otherwise, the CNE does not disclose information collected from members to third parties. Depending on the housing program, and the type of information collected, information is held for the duration of the housing project (i.e. until full payment) or until it is no longer relevant (such as a change of occupant).

Information collected by Concordia University and McGill University will be used solely for research purposes. No information will be disclosed that relates to an identifiable person. Generally, the information obtained by these institutions will be anonymized before it is disclosed to the CNE.

#### *Accuracy*

Because personal information is collected for the purposes of administering the housing program, it is important that it be accurate and up-to-date. Under CNE policies personal

information must be updated every two years to ensure its accuracy. Individuals may also periodically update or modify their information as required.

#### *Safeguards*

The CNE implemented an integrated management system auditable to ISO Standards; 9001:2015 Quality Management; 20000-1:2011 Information Technology Service Management; and 27001:2013 Information Security Management. It therefore has put in place information and data management protocols to ensure that personal and confidential information are properly collected, managed and stored.

#### *Openness*

The CNE regularly holds public meetings at which its members are informed of policies, laws and programs. The NZE housing program and the housing policies have been discussed at these meetings to ensure that members understand the information requirements and the processes and policies surrounding the collection, use and retention of their information.

#### *Access*

Under the *Constitution of the Cree Nation of Eeyou Istchee*, the CNE must set up a process to respond to access to information requests. This will include identifying the person who will respond to such requests. Presently, members attend the CNE administration offices to request access to information and documents held by the CNE.

Individuals may access information pertaining to them to ensure its accuracy and make corrections. Generally, this is done directly with the department holding the information.

#### *Grievances*

Presently, if an individual believes that information held by the CNE is inaccurate or is used in a manner that is prejudicial a grievance can be made directly to the department head. If the matter is not resolved, then the matter is usually brought to the Director General or Council. This is an informal process. As mentioned above, the CNE must establish an access to information procedure that will also include a complaints procedure.

### **CONCLUSION**

Any questions concerning this Privacy Impact Assessment may be addressed to the Project Lead.

## Smart Cities Challenge 2019

### Preliminary Privacy Impact Assessment Form

#### Finalist: Cree Nation of Eastmain

1. Description of personal information or personal health information to be collected, used or disclosed (CUD)	Yes	No	Partially
			✓
<b>Comments:</b>			
<p>Overall:</p> <ul style="list-style-type: none"> <li>Distinguish “personal information” from “non-personal information” with respect to collection, use and disclosure and specify what you determine to be personal information or personal health information. Note that PIPEDA does not cover personal health information. As such, the OPC is not in a position to comment on your reference to “health conditions” in the top table on Page 3. However, we suggest you create a separate category for personal health information, explain what that category specifically includes (i.e. health conditions of applicants), and clearly describe when personal health information is being collected, used or disclosed.</li> </ul> <p>Collection</p> <ul style="list-style-type: none"> <li>With the following sentence in section 4, “[a]ll of the information is provided directly by the applicant <del>or</del> is obtained with the consent of the applicant”, it appears CNE considers it adequate consent when information is obtained directly from the applicant. That is not necessarily so. According to the consent principle in PIPEDA, in order for consent to be meaningful the individual must also be made aware of and understand the purpose for which their information is collected. Consider providing a detailed description about your consent process</li> </ul> <p>Use</p> <ul style="list-style-type: none"> <li>Under section 6, the third paragraph suggests that no personal information will be used by Concordia University, however addresses will be disclosed by CNE to Concordia and addresses are personal information.</li> </ul> <p>Disclosure</p> <ul style="list-style-type: none"> <li>When information is required to be disclosed to the Cree Nation Government, is it personal information or personal health information? Consider whether disclosure can be limited.</li> <li>Please clarify the sentence in section 8 under <i>Cree Nation Government</i>, “[o]nly information relating to the addresses of NZE homes will be disclosed by the...and McGill University”. Please specify what additional information, if any, is being referred to here. You could also use a definition, point to a table, etc. If only addresses of NZE homes will be shared, say that.</li> </ul>			
2. Information flow map that outlines each CUD of personal information or personal health information, with a corresponding legal authority for each flow	Yes	No	Partially
			✓
<b>Comments:</b>			

This evaluation is completed with regard to Page 27 of the Smart Cities Challenge Finalist Guide.

<ul style="list-style-type: none"> <li>More clarity is needed on flow of specific information (for example, identify whether it's personal information or personal health information) between the parties. Consider making more references to the tables of types of data to be collected, used or disclosed, if it accurately represents the data flow.</li> <li>The PPIA stops short of discussing Concordia University or McGill University's policies in relation to the personal information or personal health information collected, used and disclosed as part of this project. Consider entering into contractual agreements with them with respect to their handling of personal information or personal health information associated with this project. In the alternative, CNE may wish to consider receiving assurances from the universities' that the personal information or personal health information will be handled according to applicable privacy legislation and their own privacy policies.</li> <li>In order for McGill to complete its qualitative study, is the collection of names and addresses of occupants of NZE homes necessary? Per the limiting collection principle in PIPEDA, personal information should only be collected if it is necessary. Consider whether McGill's qualitative study can be conducted without this personal information. If names and addresses are not collected, there may not be a need to anonymize the information before it is used for research and/or disclosed to third parties.</li> <li>Concordia University is expected to receive personal information identified in section 4 through "connective technologies." Consider specifying what this is. Per the safeguards principle in PIPEDA, consider whether there are adequate safeguards to protect the personal information or personal health information that will be transmitted via this method i.e. can it be encrypted, access provided to only those who need it, etc.</li> <li>Regarding legal authority for each flow: Concordia University and McGill University would be subject to privacy legislation in Quebec. Consider including a reference that indicates these two institutions are subject to applicable privacy law in Quebec.</li> </ul>							
<b>3. Description of who you will collect personal information or personal health information from to enable the project with assessment of that person's authority to disclose the information</b>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 33%; padding: 5px;">Yes</td> <td style="width: 33%; padding: 5px;">No</td> <td style="width: 33%; padding: 5px;">Partially</td> </tr> <tr> <td style="height: 30px;"></td> <td style="height: 30px;"></td> <td style="height: 30px; text-align: center;">✓</td> </tr> </table>	Yes	No	Partially			✓
Yes	No	Partially					
		✓					
<b>Comments:</b>							
<ul style="list-style-type: none"> <li>There is no description of how consent is obtained from the individual who provides his/her personal information or personal health information. There is only a statement indicating that CNE's Housing Department assumes consent is obtained when an individual directly provides their personal information or personal health information. Consider including a description of how consent is obtained from the individual. In addition, while the name and address of CNE members may be generally known given the size of Eastmain (reference to this made on Page 8 under consent), that does not constitute consent, nor mitigate the need to obtain consent, for the use of an individual's name and address.</li> <li>While it is clear that the purpose of collection was explained at public meetings during the design of the NZE program (this is in line with the PIPEDA principle of identifying purpose before or at the time of collection), consider including the purpose on the application form so that the applicant understands the purpose for why personal information is collected at the time of collection.</li> <li>With the statement in section 4, "[a]ll of the information...is obtained with the consent of the applicant", it appears some information about the individual will be obtained from third parties. If this is correct, what assurances do you have that the third party has the proper consent from the individual to disclose their personal information or personal health information to you? In addition,</li> </ul>							

This evaluation is completed with regard to Page 27 of the Smart Cities Challenge Finalist Guide.

identify who the third parties from whom the information is being obtained and specify what type of information it is (i.e. personal information or personal health information).			
<b>4. Information governance plan</b>	<b>Yes</b>	<b>No</b>	<b>Partially</b>
	✓		
<b>Comments:</b>			
<ul style="list-style-type: none"> <li>A plan is provided.</li> </ul>			
<b>5. Organizational privacy management framework, including related organizational access, correction, privacy and security policies</b>	<b>Yes</b>	<b>No</b>	<b>Partially</b>
			✓
<b>Comments:</b>			
<ul style="list-style-type: none"> <li>PPIA generally discusses overall plan related to information, however, specificity is needed re: personal information and personal health information.</li> <li>PPIA discusses steps in the event of a breach and corrective measures.</li> <li>PPIA discusses need for improvement to technological controls and the need to set up a scheme for responding to access to information requests in accordance with PIPEDA principle of individual access.</li> <li>PPIA discusses a grievance procedure in accordance with PIPEDA principle of challenging compliance.</li> <li>Consider safeguards for connective technologies.</li> <li>Consider training of individuals/employees re: collection, use and disclosure of personal information and personal health information.</li> <li>Consider implementing a retention policy for the personal information and personal health information that is collected from CNE members; ensure Concordia and McGill's policies or agreements with CNE have same for the personal information or personal health information associated with this project.</li> </ul>			
<b>6. A plan that outlines the way in which you will consider privacy and security risks throughout the process including to complete a comprehensive PIA</b>	<b>Yes</b>	<b>No</b>	<b>Partially</b>
	✓		

This evaluation is completed with regard to Page 27 of the Smart Cities Challenge Finalist Guide.

**Comments:**

- A general plan is provided.
- Consider implementing a privacy policy.
- No legend is provided for the numerical risk scale to describe what the values mean or how level of risk is evaluated.
- PPIA states McGill will be anonymizing information prior to any reporting to prevent the risk of identifying individuals. How will McGill be anonymizing this information and how reliable is its process for doing so? Consider whether the information can be re-identified and how this risk can be mitigated.

This evaluation is completed with regard to Page 27 of the Smart Cities Challenge Finalist Guide.



• ٠ ١ ٢ ٣ ٤ ٥ ٦ ٧ ٨ ٩

P.O. BOX 90, EASTMAIN, QUEBEC J0M 1W0  
Tel.: (819) 977-0211-0266  
Fax: (819) 977-0281

**Res. No. 2017-2018/03-01-001**

**WHEREAS** the Members of the Cree Nation of Eastmain having met this 1<sup>st</sup> day of March, 2018;

**RESOLVED:**

**THAT** the Band Secretary be and is hereby mandated to provide a certified copy of this resolution to all appropriate authorities:

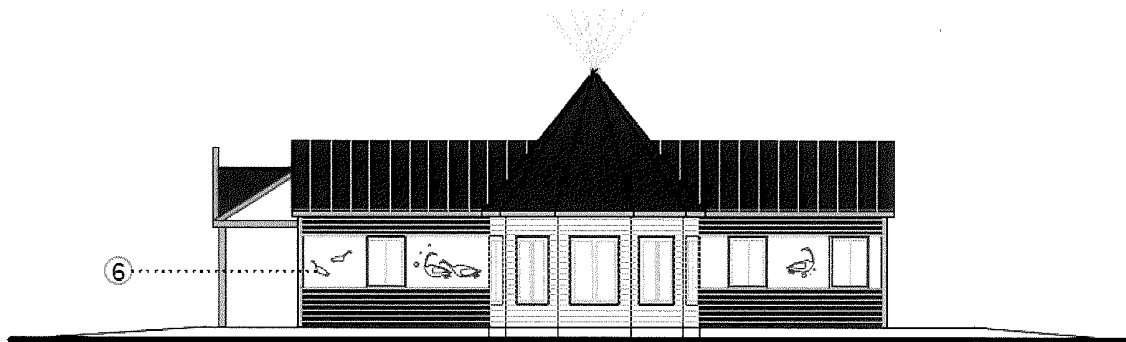
**PROPOSED BY:** Gordon Gilpin  
**SECONDED BY:** Raymond Shanoush  
**ACTION:** Carried

**CERTIFIED TRUE COPY** of a resolution adopted by the Members of the Cree Nation of Eastmain acting through its Members' meeting a where a quorum of was present this 1<sup>st</sup> day of March, 2018.

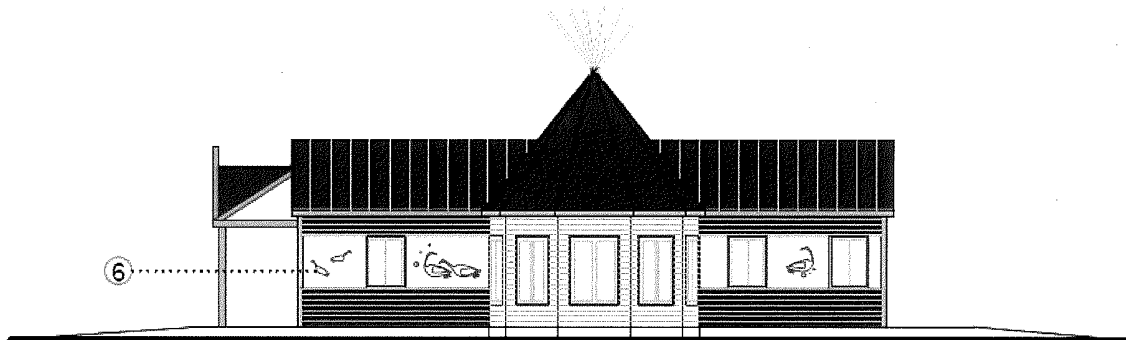
**Band Secretary**

**Cree Nation of Eastmain  
Smart City Challenge Housing Projects**

**CREE ELDERS HOUSE : ELEVATIONS**

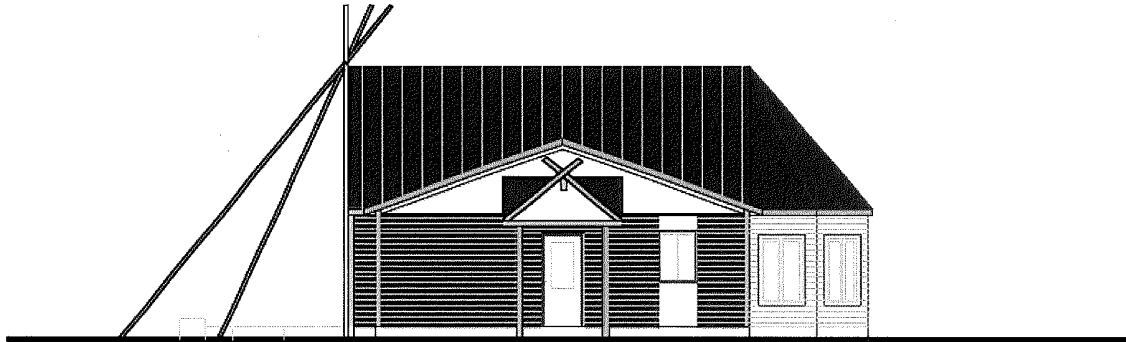


**South Elevation**

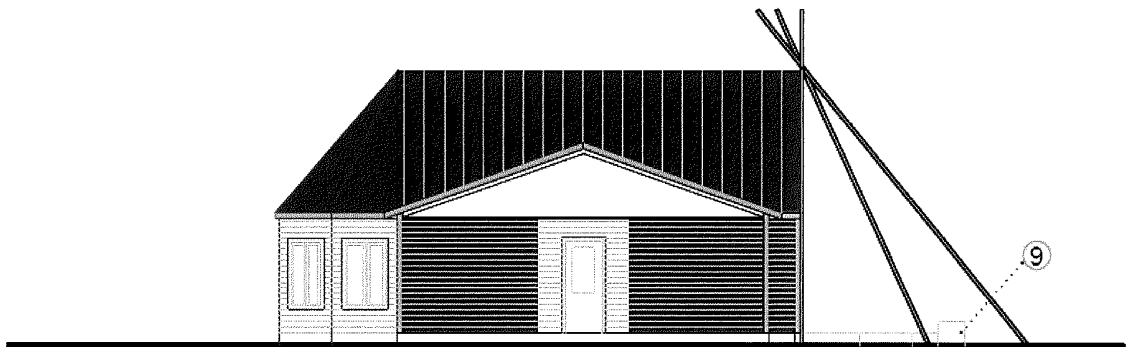


**North Elevation**

**CREE ELDERS HOUSE : ELEVATIONS**

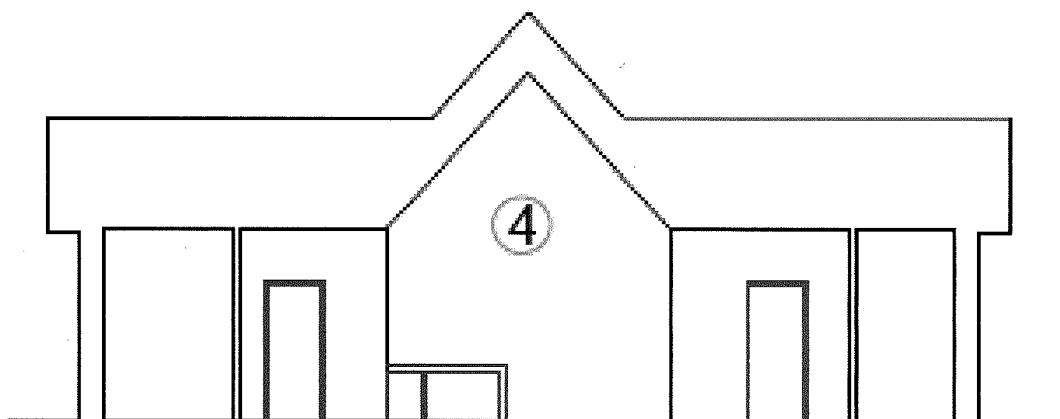


**East Elevation**



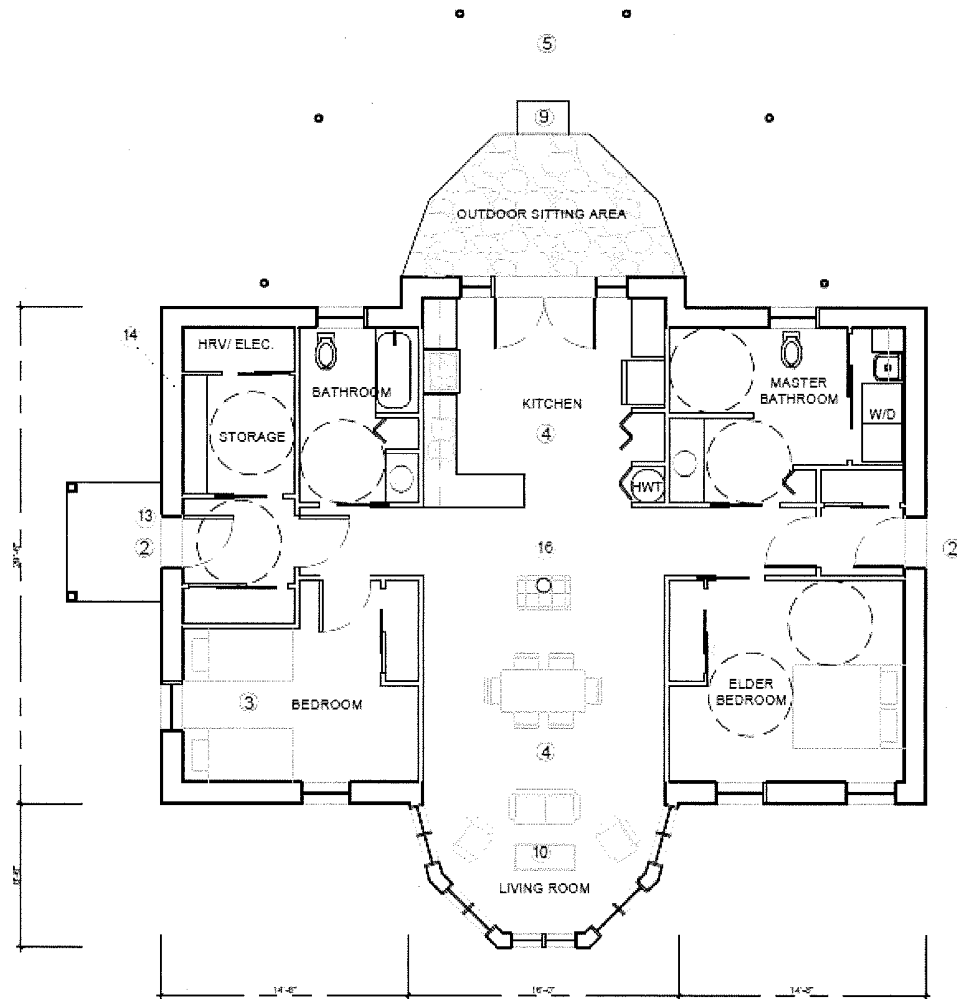
**West Elevation**

**CREE ELDERS HOUSE : SECTION**



**Section**

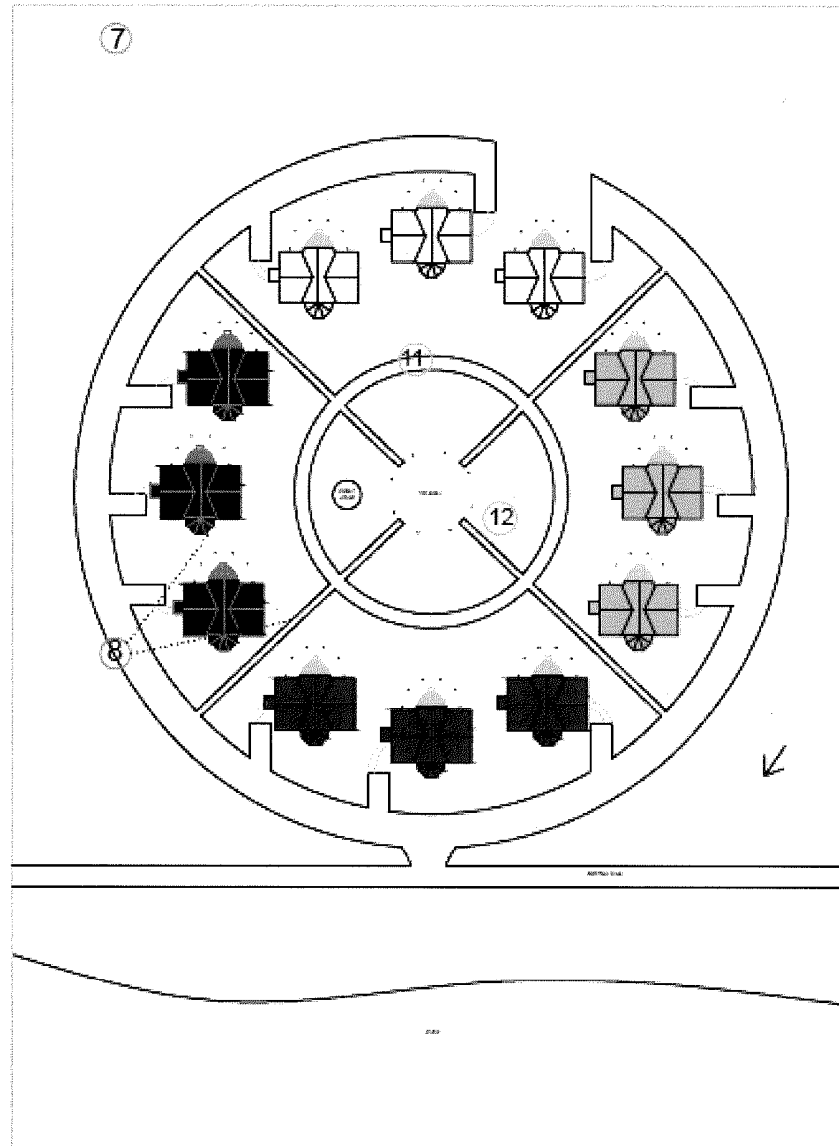
**CREE ELDERS HOUSE : FLOOR PLAN**



**Floor Plan**

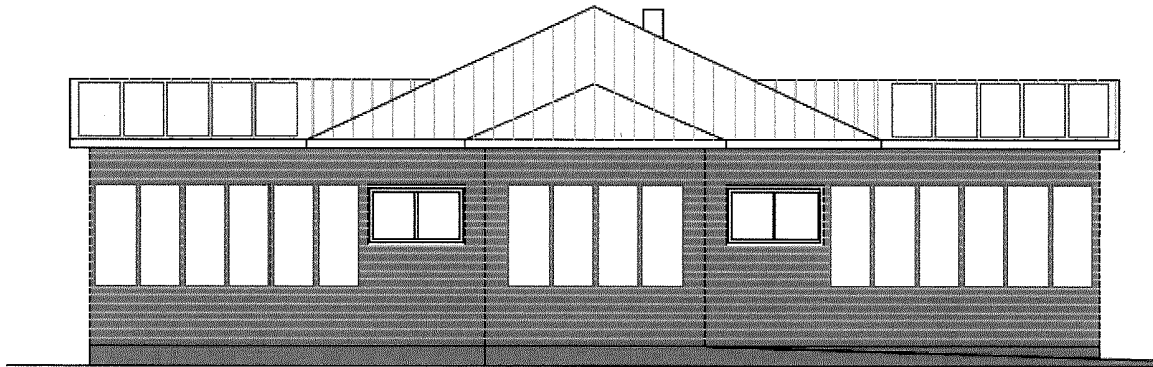
**Cree Nation of Eastmain  
Smart City Challenge Housing Projects**

**CREE ELDERS COMMUNITY**

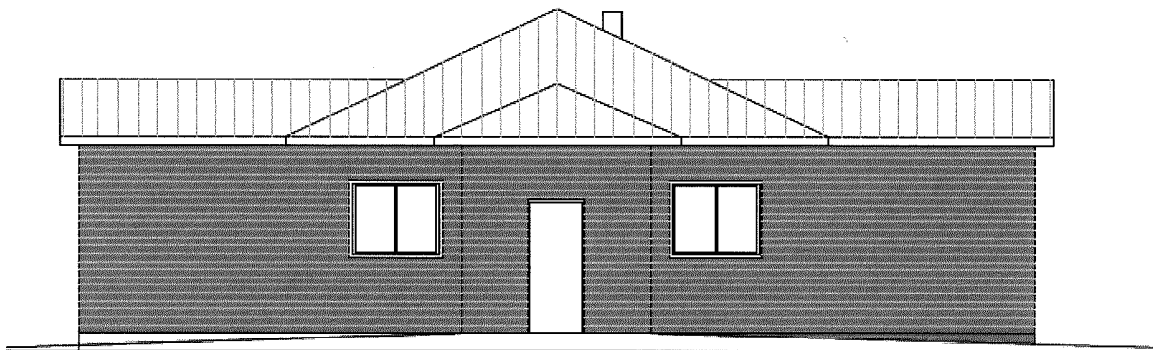


**Cree Nation of Eastmain  
Smart City Challenge Housing Projects**

**STARTER HOUSE : ELEVATIONS**

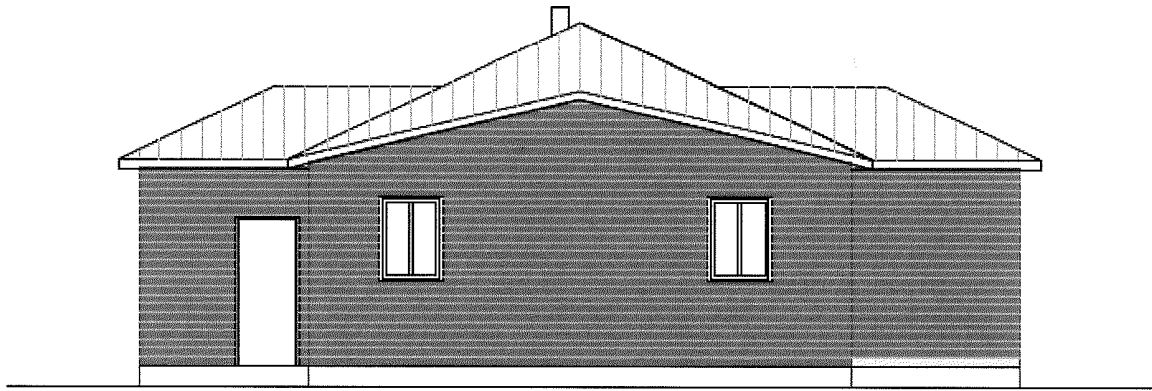


**South Elevation**

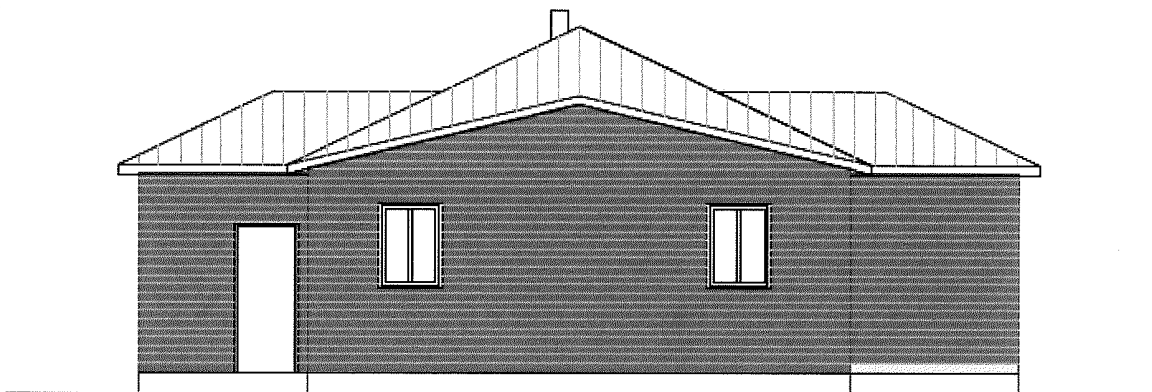


**North Elevation**

**STARTER HOUSE : ELEVATIONS**



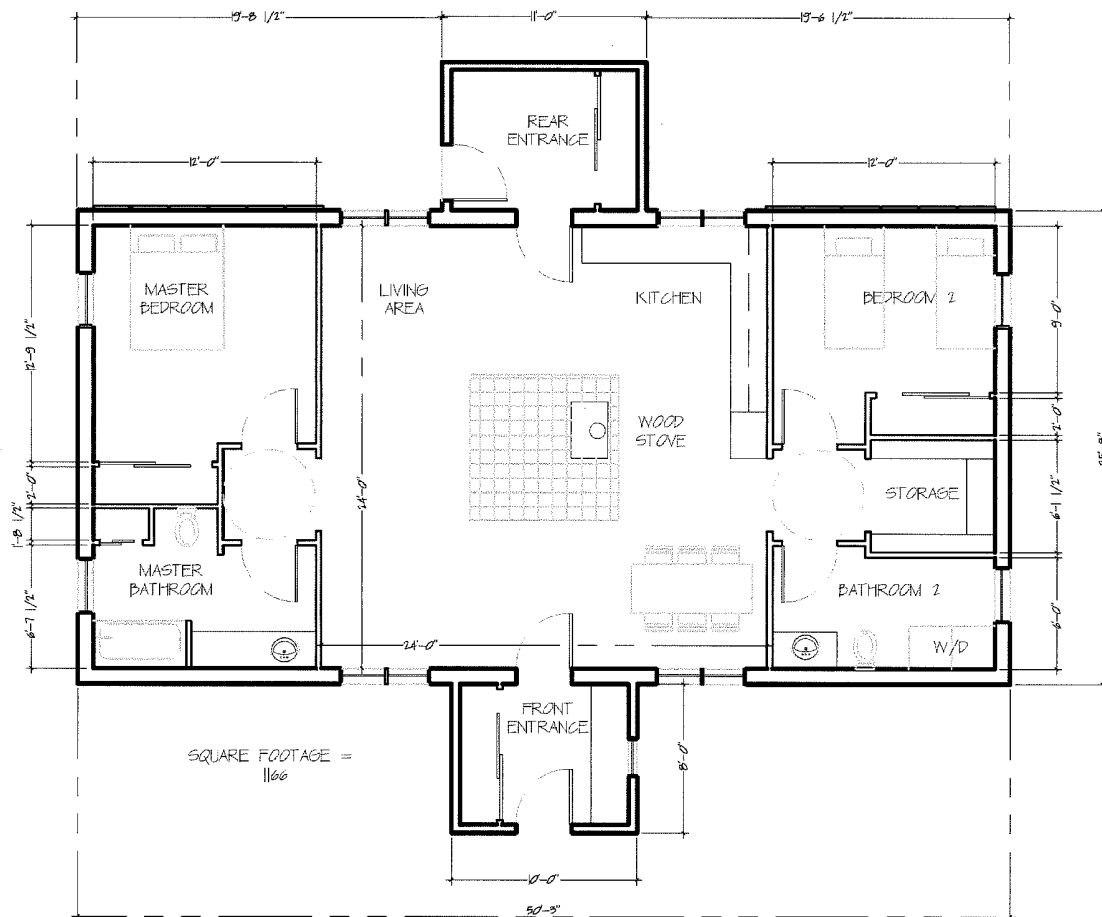
**West Elevation**



**East Elevation**

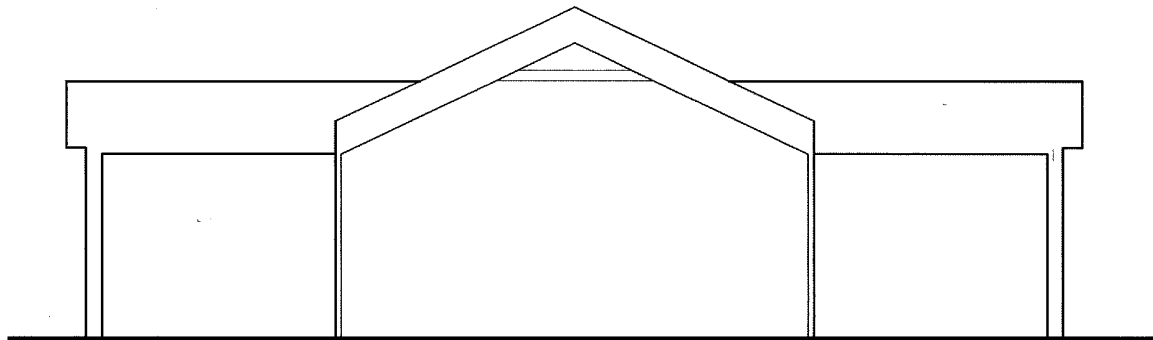


**STARTER HOUSE : PLANS**



**Floor Plan**

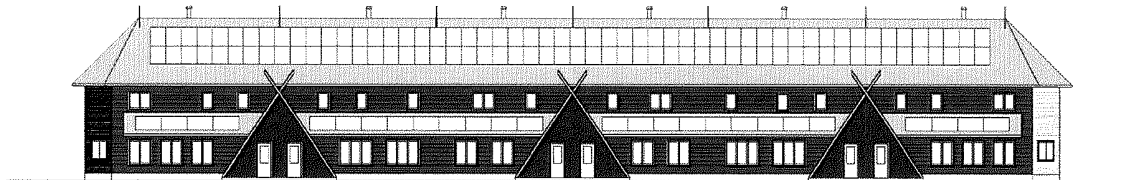
**STARTER HOUSE : SECTION**



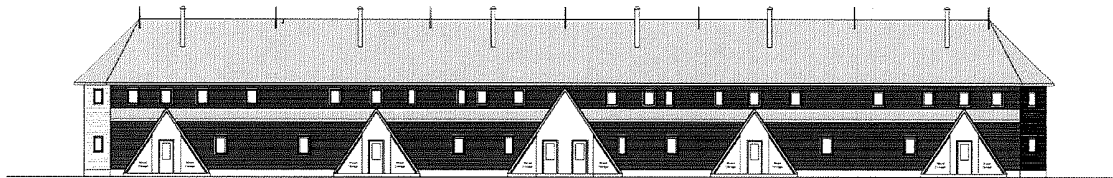
**Section**

Cree Nation of Eastmain  
Smart City Challenge Housing Projects

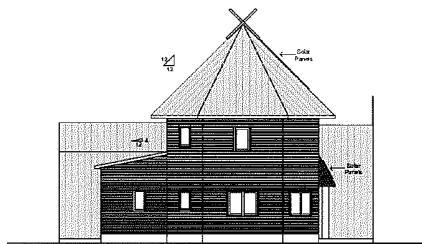
**MULTI-CLIENT SIX PLEX : ELEVATIONS**



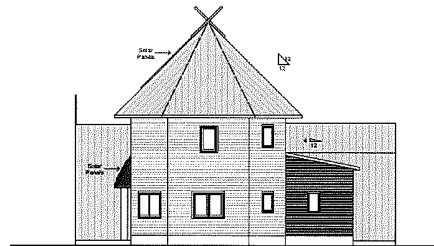
**South Elevation**



**North Elevations**

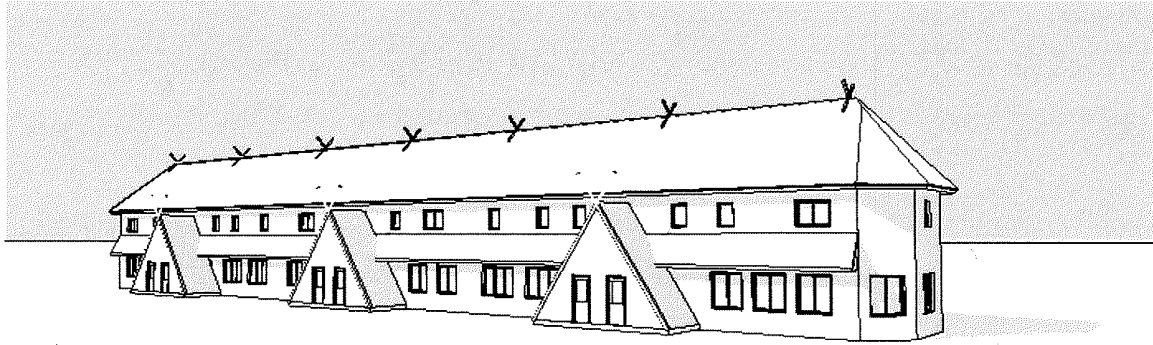


**West Elevation**

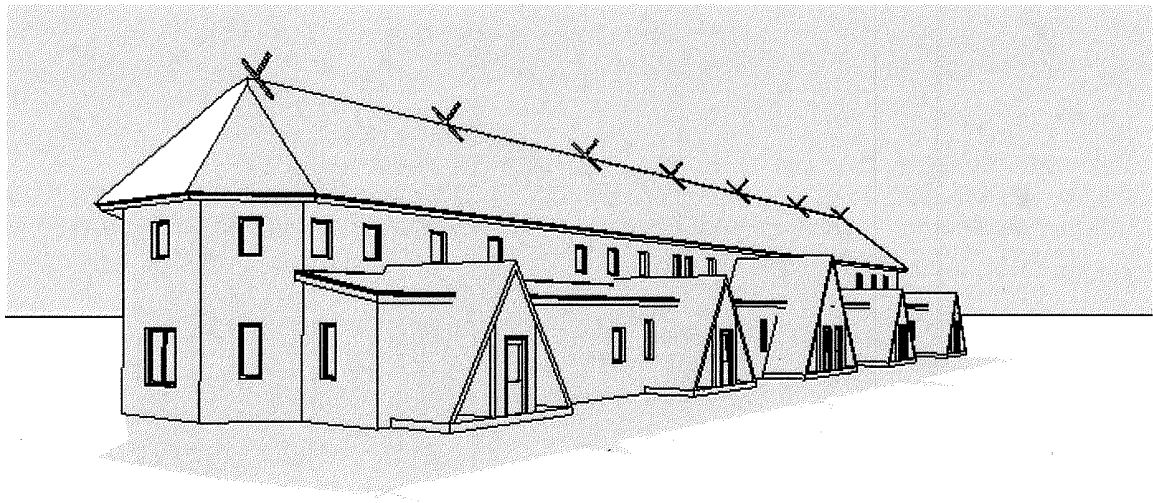


**East Elevation**

**MULTI-CLIENT SIX PLEX : PERSPECTIVES**

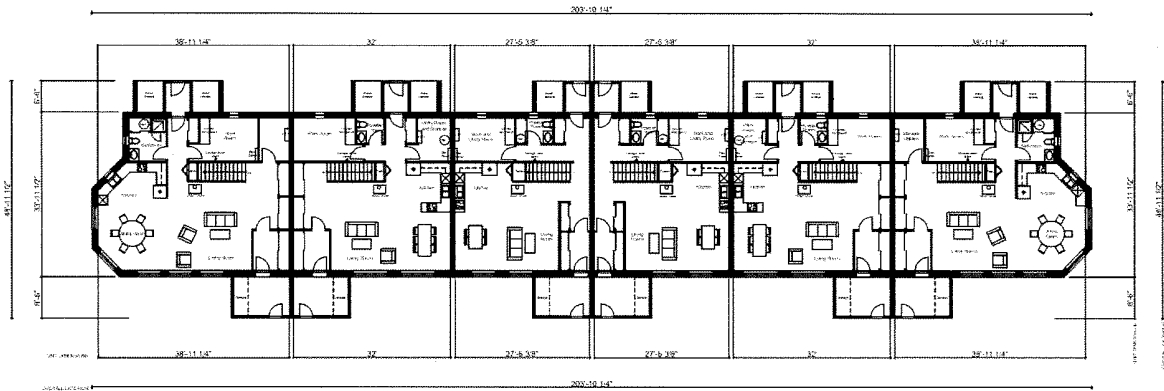


**South Perspective**

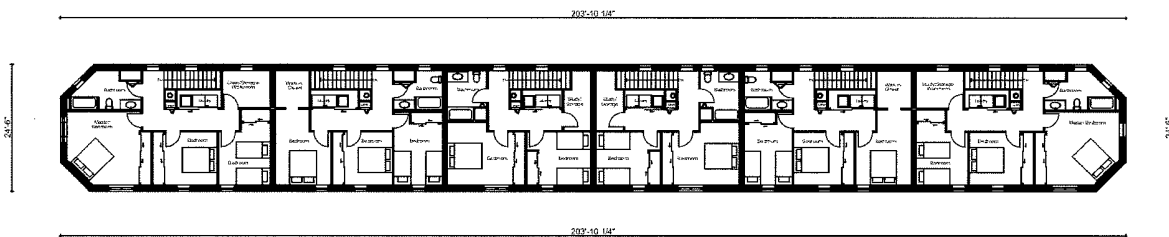


**North Perspective**

## MULTI-CLIENT SIX PLEX : FLOOR PLANS

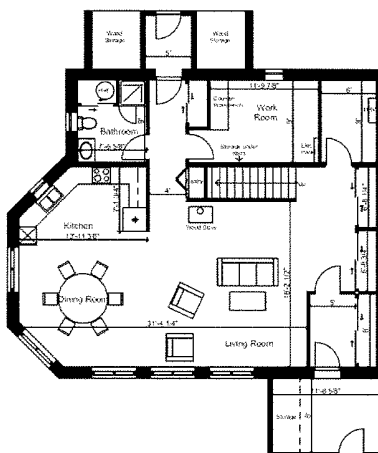


First Floor

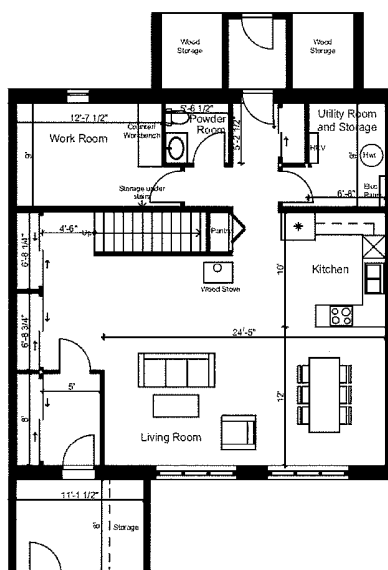
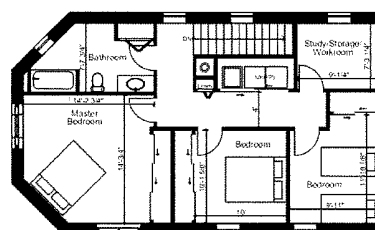


Second Floor

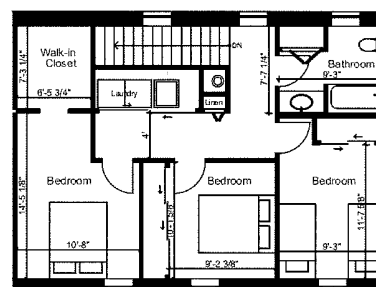
## MULTI-CLIENT SIX PLEX : CLIENT UNIT FLOOR PLANS



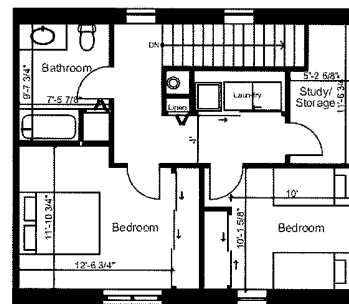
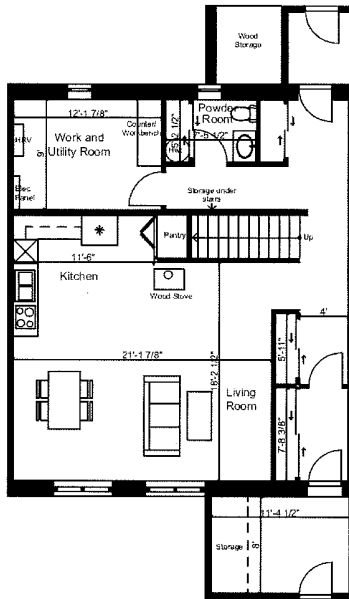
**Homeownership Unit**



**Rent to Own Unit**



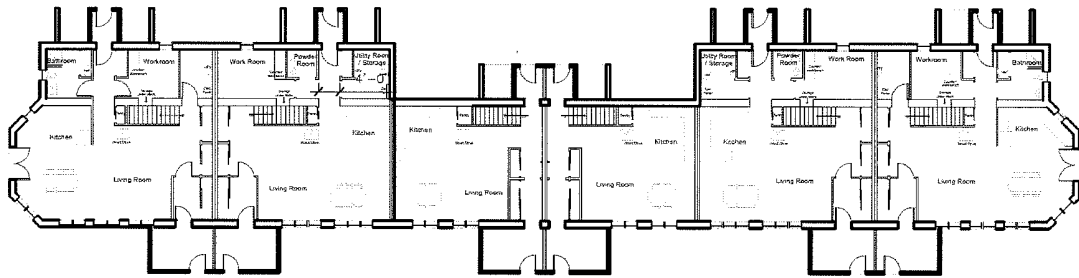
**MULTI-CLIENT SIX PLEX : CLIENT UNIT FLOOR PLANS**



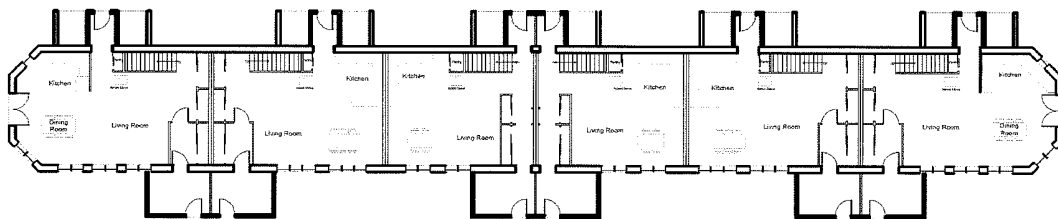
**Social Housing Unit**

**MULTI-CLIENT SIX PLEX : FLOOR PLAN FLEXIBILITY**

- With first floor addition removed from social housing units if needed to reduce floor plan to meet budget requirements



**First Floor**

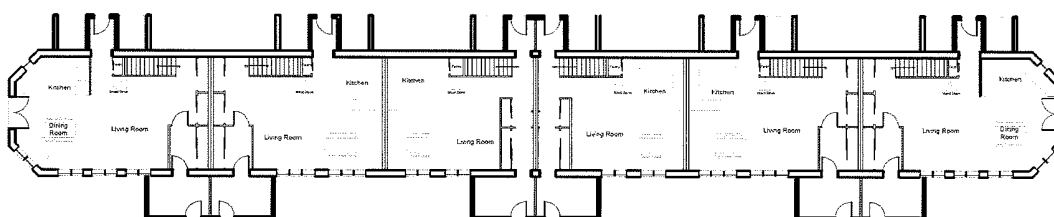


**Second Floor**

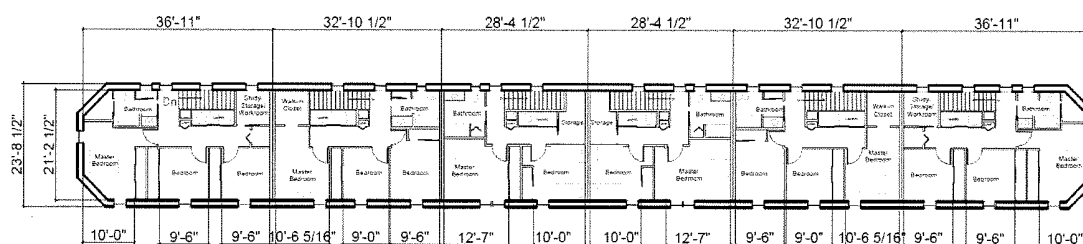


## MULTI-CLIENT SIX PLEX : FLOOR PLAN FLEXIBILITY

- With first floor addition removed from all units to reduce floor plan if needed to meet budget requirements



First Floor



Second Floor

Saskatoon  
(as received)

**From:** SC / VI (INFC)  
**Sent:** March 7, 2019 11:59 AM  
**To:** Beveridge, Michelle  
**Subject:** Smart Cities Challenge - Successful Final Proposal Submission

Dear Michelle,

Congratulations! Your submission is ready to move onto evaluation following a completeness check (per the latest FAQs).

Thank you for your cooperation, patience, and hard work, especially during the past eight months. We are truly honoured to have worked with you and wish you the best of luck in the competition!

On a related matter, we have recently determined that it will not be feasible to post final proposals on the Infrastructure Canada website in a timely manner. Instead, we will take an approach similar to the application stage and publish your executive summary in both official languages on the Infrastructure Canada website with a link to the final proposal on your website. We understand that posting the final proposal on your website is not a requirement contained in the finalist guide so we appreciate your cooperation in facilitating access to your final proposal in an open and transparent way. Please note that the accessibility materials you have prepared for your final proposal will still be helpful in preparing various communications products to promote and share knowledge of your work.

Once you have posted your final proposal on your website, please send us the link if you haven't done so already. If you anticipate that you will be unable to post your final proposal on your website within two weeks, please let us know.

As always, we are happy to answer any questions. The best way to reach us going forward would be at our generic account: [infc.sc-vi.infc@canada.ca](mailto:infc.sc-vi.infc@canada.ca).

Thank you.

**Smart Cities Challenge Team**  
Infrastructure Canada  
[infc.sc-vi.infc@canada.ca](mailto:infc.sc-vi.infc@canada.ca)

## COMPLETE CHECK FOR FINAL PROPOSAL

<b>FINALIST:</b> Saskatoon				
<b>ASSESSED BY:</b> Susan Hwang				
<b>VALIDATED BY:</b> Alex Long				
<b>APPROVAL BY:</b> <i>select one: Jenny Tremblay / Eric Poirier</i>				
<b>DATE OF COMPLETION:</b> March 5, 2019				
REQUIREMENTS	COMPLETED	IF NOT COMPLETED, NOTE REASON	GUIDING PRINCIPLES	ACTIONS
<b>SUBMISSION</b>				
Submitted to <a href="mailto:infsc-vi.infsc@canada.ca">infsc-vi.infsc@canada.ca</a> by 23:59 PST on March 5, 2019	<input checked="" type="checkbox"/>		<ul style="list-style-type: none"> <li>No extensions will be granted</li> <li>No exceptions will be made for lateness or technical problems (finalist must be able to show evidence of submission)</li> </ul>	<ul style="list-style-type: none"> <li># to contact finalist</li> <li>If not resolved, # to flag to DG for decision</li> </ul>
Final proposal is submitted	<input checked="" type="checkbox"/>		<ul style="list-style-type: none"> <li>No extensions will be granted</li> <li>There is flexibility on the finalist video until the end of the week</li> </ul>	<ul style="list-style-type: none"> <li>Assessor to save everything in designated folders</li> <li># to contact finalist if anything is missing</li> <li>If not resolved, # to flag to DG for decision</li> </ul>
Finalist video is submitted	<input checked="" type="checkbox"/>		<ul style="list-style-type: none"> <li>There is flexibility on the finalist video until the end of the week</li> </ul>	<ul style="list-style-type: none"> <li>Assessor to save everything in designated folders</li> <li># to contact finalist if anything is missing</li> <li>If not resolved, # to flag to DG for decision</li> </ul>
Preliminary Privacy Impact Assessment or Preliminary Rationale Analysis	<input checked="" type="checkbox"/>		<ul style="list-style-type: none"> <li>No extensions will be granted</li> </ul>	<ul style="list-style-type: none"> <li>Assessor to save everything in designated folders</li> <li># to contact finalist if anything is missing</li> <li>If not resolved, # to flag to DG for decision</li> </ul>
<b>FINAL PROPOSAL</b>				
Written in one of Canada's official languages	<input checked="" type="checkbox"/>		<ul style="list-style-type: none"> <li>If the final proposal is submitted in a language other than English or French, a companion version in English or French is required from the finalist</li> </ul>	<ul style="list-style-type: none"> <li># to extract the executive summary from the final proposal and send it to translation (if a French final proposal, send the entire document to translation)</li> </ul>
Generally readable (e.g. picture is not covering text, text are not overlapping)	<input checked="" type="checkbox"/>		<ul style="list-style-type: none"> <li>If there are serious formatting issues that hinders readability, the finalist may need to resubmit</li> </ul>	<ul style="list-style-type: none"> <li># to do a scan of the final proposal and verify that all text and tables, graph, etc. could be read</li> </ul>
Text-based and in either MS Word (.doc or .docx) or a fully readable, searchable, and selectable PDF (.pdf) format	<input checked="" type="checkbox"/>		<ul style="list-style-type: none"> <li>Finalist may adjust the format for INFC posting purposes after the deadline</li> </ul>	<ul style="list-style-type: none"> <li># to verify with Comms if format is suitable for posting, given INFC web accessibility standards</li> <li>If not suitable, # to contact finalist</li> </ul>
No longer than 75 pages* (Financial chapter exempted) and in 12 point font	<input checked="" type="checkbox"/>	Recounted – now within reasonably acceptable variance	<ul style="list-style-type: none"> <li>Finalist cannot adjust content after the deadline</li> <li>If the text overall is smaller than 12 point font, INFC will adjust and evaluate within the new page count</li> </ul>	<ul style="list-style-type: none"> <li># to notify finalist if final proposal is over 75 pages</li> <li># to notify finalist if INFC had to adjust the font and page count</li> </ul>

Contains an executive summary	<input checked="" type="checkbox"/>			<ul style="list-style-type: none"> <li># to QC and save translated version into the designated folder</li> </ul>
<b>Organized by these distinct chapters (not limited to these; not necessarily in the same order):</b> <ul style="list-style-type: none"> <li>Vision</li> <li>Performance measurement</li> <li>Project management</li> <li>Technology</li> <li>Governance</li> <li>Engagement</li> <li>Data and privacy</li> <li>Financial</li> <li>Implementation phase requirements</li> </ul>	<input checked="" type="checkbox"/>	Added Risk Management chapter; renamed Vision to Vision and Challenge Statement chapter; renamed Engagement to Community Engagement Journey chapter	<ul style="list-style-type: none"> <li>Finalist must have these chapters</li> <li>Finalist can have more chapters</li> <li>Finalist can change the order of the chapters</li> </ul>	<ul style="list-style-type: none"> <li>If the chapters are not clearly labeled, # to do a light analysis of where the content may be and make a note for the Jury</li> </ul>
<b>FINALIST VIDEO</b>				
No longer than five minutes	<input checked="" type="checkbox"/>		<ul style="list-style-type: none"> <li>Finalist may cut down the time for INFC posting purposes after the deadline</li> </ul>	<ul style="list-style-type: none"> <li># to notify finalist if video is longer than five minutes and needs cutting down</li> </ul>
Submitted as a file or in a downloadable format	<input checked="" type="checkbox"/>	NOTE: Accessibility document not submitted; will follow-up if required	<ul style="list-style-type: none"> <li>Finalist may adjust the format for INFC posting purposes after the deadline</li> </ul>	<ul style="list-style-type: none"> <li># to verify with Comms if format is suitable for posting, given INFC web accessibility standards</li> <li>If not suitable, # to contact finalist</li> </ul>
<b>CONFIDENTIAL ANNEX (OPTIONAL)</b>				
Submitted if and only if required	<input type="checkbox"/>	N/A		<ul style="list-style-type: none"> <li># to flag with DG if confidential annex is lengthy</li> </ul>

**From:** Beveridge, Michelle <Michelle.Beveridge@Saskatoon.ca>  
**Sent:** March 3, 2019 7:03 PM  
**To:** SC / VI (INFC)  
**Cc:** Long, Alexander (INFC)  
**Subject:** Re: letter of support

Perfect, thanks!

**Michelle Beveridge**  
Chief of Staff, Office of Mayor Charlie Clark  
City of Saskatoon | 222 3rd Avenue North | Saskatoon, SK S7K 0J5  
Treaty 6 Territory & Homeland of the Metis  
Office: 306.975.3500  
Mobile: 306.229.4471

On Mar 3, 2019, at 5:47 PM, SC / VI (INFC) <[infc.sc-vi.infc@canada.ca](mailto:infc.sc-vi.infc@canada.ca)> wrote:

A letter of support from the community leadership is not a requirement in the same way it was in the application. We are asking finalists to include what makes sense for their final proposal based on the relevant requirements and the evaluation criteria. Hope that helps.

**Smart Cities Challenge Team**  
Infrastructure Canada  
[infc.sc-vi.infc@canada.ca](mailto:infc.sc-vi.infc@canada.ca)

**From:** Beveridge, Michelle [<mailto:Michelle.Beveridge@Saskatoon.ca>]  
**Sent:** March 3, 2019 2:41 PM  
**To:** SC / VI (INFC) <[infc.sc-vi.infc@canada.ca](mailto:infc.sc-vi.infc@canada.ca)>  
**Cc:** Long, Alexander (INFC) <[alexander.long@canada.ca](mailto:alexander.long@canada.ca)>  
**Subject:** RE: letter of support

Hi,  
We have letters of support from our 11 institutional partners, it just isn't clear from the evaluation criteria whether the host city submitting the proposal needs to also include an official letter from the Mayor indicating support.  
Thanks,  
Michelle

**Michelle Beveridge**  
Chief of Staff, Office of Mayor Charlie Clark  
City of Saskatoon | 222 3rd Avenue North | Saskatoon, SK S7K 0J5  
Treaty 6 Territory & Homeland of the Metis  
Office: 306.975.3500  
Mobile: 306.229.4471

**From:** SC / VI (INFC) [<mailto:infc.sc-vi.infc@canada.ca>]  
**Sent:** Sunday, March 3, 2019 1:22 PM  
**To:** Beveridge, Michelle <[Michelle.Beveridge@Saskatoon.ca](mailto:Michelle.Beveridge@Saskatoon.ca)>

**Cc:** Long, Alexander (INFC) <[alexander.long@canada.ca](mailto:alexander.long@canada.ca)>

**Subject:** RE: letter of support

We ask for evidence of partnerships as part of your governance plan, which could be in the form of a letter. Please take a look at the requirements and the evaluation criteria for Chapter 5 to determine what you'd like to include.

**Smart Cities Challenge Team**

Infrastructure Canada

[infsc-vi.infc@canada.ca](mailto:infsc-vi.infc@canada.ca)

**From:** "Beveridge, Michelle" <[Michelle.Beveridge@Saskatoon.ca](mailto:Michelle.Beveridge@Saskatoon.ca)>

**Date:** March 2, 2019 at 5:44:14 PM EST

**To:** "Long, Alexander (INFC)" <[alexander.long@canada.ca](mailto:alexander.long@canada.ca)>

**Subject:** letter of support

Hi Alex,

Do we need a letter of support from Mayor Clark on behalf of the City of Saskatoon?

Thanks,

mb

**Michelle Beveridge**

Chief of Staff, Office of Mayor Charlie Clark

City of Saskatoon | 222 3rd Avenue North | Saskatoon, SK S7K 0J5

Treaty 6 Territory & Homeland of the Metis

Office: 306.975.3500

Mobile: 306.229.4471

Jacaban2, Evalynne (INFC)

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**From:** SC / VI (INFC)  
**Sent:** March 5, 2019 3:27 PM  
**To:** Beveridge, Michelle  
**Subject:** RE: Final Proposal - CITY OF SASKATOON

Hello,

Thank you for your submission. Please consider this email as acknowledgement of receipt. We will follow up with you to confirm that your final proposal is ready for evaluation.

Thank you.

**Smart Cities Challenge Team**  
Infrastructure Canada  
[infc.sc-vi.infc@canada.ca](mailto:infc.sc-vi.infc@canada.ca)

**From:** Beveridge, Michelle [mailto:Michelle.Beveridge@Saskatoon.ca]  
**Sent:** March 5, 2019 2:13 PM  
**To:** SC / VI (INFC) <[infc.sc-vi.infc@canada.ca](mailto:infc.sc-vi.infc@canada.ca)>  
**Cc:** Beveridge, Michelle <Michelle.Beveridge@Saskatoon.ca>  
**Subject:** Final Proposal - CITY OF SASKATOON

Please accept the City of Saskatoon's Final Proposal submission.

Included in this email are:

1) The link to the proposal via Dropbox (which had been previously tested)

- Dropbox Link for proposal: [REDACTED]

2) The link to download our video submission.

- Video Link: [REDACTED]

Here is the contact information for our main point of contact:

- Name: Michelle Beveridge
- Email: [michelle.beveridge@saskatoon.ca](mailto:michelle.beveridge@saskatoon.ca)
- Phone: 306-975-3500

Thank you!



Michelle

**Michelle Beveridge**

Chief of Staff, Office of Mayor Charlie Clark  
City of Saskatoon | 222 3rd Avenue North | Saskatoon, SK S7K 0J5  
Treaty 6 Territory & Homeland of the Metis  
Office: 306.975.3500  
Mobile: 306.229.4471

## Cardinal2, Patrick (INFC)

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**From:** Platero, Marjorie OIPC <mplatero@oipc.sk.ca>  
**Sent:** March 20, 2019 12:43 PM  
**To:** Tremblay, Jenny (INFC)  
**Subject:** FW: OIPC Letter to City of Saskatoon - Smart Cities Challenge - ConnectYXE Program  
**Attachments:** Letter to City of Saskatoon - ConnectYXE Project - SmartCities Challenge - March 20 2019.pdf

Good Morning Ms. Tremblay,

Please find attached a copy of our office's letter to the City of Saskatoon, further to the City's participation in the Smart Cities Challenge. Thank you,

Marjorie

**Marjorie Platero**

Analyst

**bus:** 306-798-2360

**email:** [mplatero@oipc.sk.ca](mailto:mplatero@oipc.sk.ca)

**website:** [www.oipc.sk.ca](http://www.oipc.sk.ca)

**twitter:** [@SaskIPC](https://twitter.com/SaskIPC)

503—1801 Hamilton Street  
Regina, Saskatchewan S4P 4B4

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**From:** Platero, Marjorie OIPC  
**Sent:** Wednesday, March 20, 2019 10:03 AM  
**To:** 'Atkinson, Wenda' <Wenda.Atkinson@Saskatoon.ca>  
**Subject:** OIPC Letter to City of Saskatoon - Smart Cities Challenge - ConnectYXE Program

Hi Wenda,

Please find attached our office's letter in response to the PPIA for the ConnectYXE program. Please note that a copy of this letter will also be forwarded today to Ms. Jenny Tremblay, Director General for the Smart Cities Challenge Directorate.

We would like to congratulate the City of Saskatoon again for being selected a finalist in the Smart Cities Challenge, and we wish the City best of luck in the next phase of the Challenge. Please do not hesitate to contact me if you have any questions regarding the attached letter.

Thank you,

Marjorie

**Marjorie Platero**

Analyst

bus: 306-798-2360

email: [mplatero@oipc.sk.ca](mailto:mplatero@oipc.sk.ca)

website: [www.oipc.sk.ca](http://www.oipc.sk.ca)

twitter: [@SaskIPC](https://twitter.com/SaskIPC)

503—1801 Hamilton Street  
Regina, Saskatchewan S4P 4B4

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Office of the  
Saskatchewan Information  
and Privacy Commissioner

March 20<sup>th</sup>, 2019

Wenda Atkinson  
Access and Privacy Officer  
City of Saskatoon  
222 3<sup>rd</sup> Avenue North, Saskatoon, SK S7K 0J5

Dear Ms. Atkinson:

**Re: Preliminary Privacy Impact Assessment - ConnectYXE Program**

This letter is in response to the Preliminary Privacy Impact Assessment (PPIA) for the Connect YXE Program, which was received by our office on February 15, 2019. An amended version of the PPIA was later received on February 27, 2019, following a telephone conversation between our office and the City of Saskatoon (City). The PPIA forms part of the City's final proposal for their participation in the Government of Canada's Smart Cities Challenge.

**BACKGROUND**

In November 2017, the Government of Canada launched the Smart Cities Challenge (Challenge) which challenged communities across Canada to develop projects to improve the lives of citizens using data and connected technology. The Government of Canada received and assessed over 200 applications and of those, twenty finalists were chosen including the City of Saskatoon. The Challenge offers finalists an opportunity to win prize money in the amount \$5 million, \$ 10 million or \$ 50 million dollars to develop and implement their proposed projects. The City is competing in the \$ 10 million dollar prize category.

In April 2018, Canada's federal, provincial and territorial privacy protection authorities, including our office, wrote to the Minister of Infrastructure and Communities to urge the Government of Canada to take proactive steps to ensure that privacy and security of personal information are considered in the selection, design and implementation of the winning proposals.

In this regard, in August 2018, Infrastructure Canada issued a finalist guide requiring all finalists to engage with the privacy protection authority in their jurisdiction and to submit a final proposal that contains, among other elements, a chapter on data and privacy. The guide also requires that the final proposal include a PPIA that would also be provided to the privacy protection authority in their jurisdiction, if the proposed project will involve personal information. If the project will not involve personal information, a

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Preliminary Rationale Analysis would be required instead. The purpose of the Preliminary Rationale Analysis is to document how the finalist determined that personal information would not be involved in their project.

Our office wrote to the City on June 12, 2018 to congratulate the City on becoming a finalist and encouraged the City to consult with our office to provide details regarding the City's proposed project. Telephone calls between our offices took place on February 11, 2019 and February 25, 2019 to discuss the City's project in general terms and to clarify our office's expectation regarding the PPIA to be submitted. On February 15, 2019 and February 27, 2019, our office received copies of the City's:

- Finalist proposal
- ConnectYXE PPIA
- Digital Information Technology Security Policy
- Privacy and Confidentiality Policy
- Data Management Plan
- Privacy Breach Protocol

As stated in the finalist proposal, ConnectYXE will combine technology to connect indigenous youth, and their families and supporters, with existing service provider organizations in Saskatoon, to reduce indigenous youth incarceration. At a basic level, ConnectYXE has two components: the front-end which offers various methods for users to interact with ConnectYXE, and the back-end which involves creating a large repository of data to provide content to ConnectYXE and which serves to identify trends, generate reports and evaluate services. ConnectYXE involves many third party service organizations in Saskatoon and a third party service provider who will provide and manage the technology for the back-end component of the program.

We would like to commend the City of Saskatoon for taking on such an important social issue and for the time and effort the City has devoted thus far to developing its innovative solution. Our comments below are focused primarily on the contents of the finalist proposal and the ConnectYXE PPIA. Given that the ConnectYXE program is in the early stages of development, with most of its components at the conceptual stage, our comments are high level and serve to identify potential areas that may need to be further examined via a Privacy Impact Assessment.

#### **COMMENTS ON FINAL PROPOSAL AND PPIA**

##### ***Does the ConnectYXE program involve personal information, or personal health information?***

Based on the contents of the finalist proposal and the PPIA, it is unclear whether the City has appropriately assessed whether personal information or personal health information, is, or will be, involved. The finalist proposal describes various components of the overall program that could collect personal information. For instance, on page 18 to 21, the proposal states that the front-end component of ConnectYXE will allow a user to interact with ConnectYXE using various methods such as: a smartphone app, a mobile device, a public or personal computer, a public touch screen (kiosk), telephone, chat and Facebook. The proposal does not elaborate on whether any personal information may be collected from users via these various

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methods, especially via social media, nor discuss how ConnectYXE will prevent certain personal information from being collected in the first place, if that is the goal.

Devices connected to the internet, with or without Wi-Fi, have the ability to connect and communicate a wide range of online and offline information that may include location, browsing history, IP addresses, device unique identifiers, media access control (MAC) address, among other information. Furthermore, mobile apps, if not developed in a privacy conscious way, may collect or have access to personal information stored on a user's mobile phone. Federal, provincial and territorial privacy protection authorities in Canada, and elsewhere, have already issued various investigation reports and guidance documents related to these issues, which we would encourage the City to consult should they win in their category and continue developing the ConnectYXE program.

In regards to the ability of users to interact with ConnectYXE by calling in to the system, or using a chat feature, it is unclear if there will be transcripts produced from these calls and chats and if these transcripts will be retained, even for a short period of time. Users who call and use the chat feature may inadvertently provide personal information, even if it is not requested. In these circumstances, the City cannot fully control what information a user provides.

Furthermore, the illustration use case provided on page 5 of the proposal states that if a youth connects to ConnectYXE and accepts an offer to receive a free transit pass to get to a shelter, ConnectYXE would need to communicate with the youth's phone to provide that free pass. The use case does not provide details of the personal information needed to provide the free pass as a token to a user's phone. Presumably, this would require the youth to provide identifying information such as their mobile phone number so they can receive the pass via text, or an email address to complete the transaction. Our office sees value in offering various communication methods to users of ConnectYXE but these methods should be developed and implemented with appropriate measures to protect personal information.

Additionally, page 6 of the final proposal indicates that measuring outcomes related to the use of ConnectYXE will involve outputs such as the number of users and repeat users. Collecting data about the number of users could involve collecting aggregate data; however, it is unclear how the City would know who is a repeat user without the ability to identify specific users and to know when they have interacted with ConnectYXE more than once. Such information could be personal information.

An earlier version of the final proposal provided to our office indicated that a future iteration of the ConnectYXE would allow users to authenticate to ConnectYXE and maintain a personal profile within the system. It is unclear why this information was removed from the subsequent version of the proposal provided to our office – whether because these features will no longer be offered at all, or if such features were considered to be too far into the future to be included in the proposal for the Smart Cities Challenge. If there are future plans for ConnectYXE to allow users to create profiles and be authenticated, our office would not be opposed to these features. However, our office would expect these features to comply with privacy legislation in the province and to have built-in privacy protections. Additionally, our office would expect the City to undertake appropriate security and privacy assessments to identify and mitigate any potential risks.

Based on the contents of the proposal, as it relates to users interacting with ConnectYXE, it is unclear how the City arrived at the conclusion in the PPIA that the ConnectYXE program will not require users to

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authenticate nor to provide personal information. As stated previously, although many components of the ConnectYXE are at the conceptual stage, our office expected that the City would map out the information flows for the various communication methods that will be offered to users, and to list all the information that may be collected, shared, used and retained for each method. This would provide an opportunity to identify potential collections of personal information, or personal health information, and to identify areas to be assessed later via a PIA. Our office communicated this expectation to the City on February 7, 2019 via email correspondence and also highlighted the importance of considering context in making the determination about whether or not personal information could be collected.

In regards to the back-end component of the ConnectYXE, the final proposal states that all partners, including community based organization, will transfer data to a large data repository managed by a third party service provider, ISM Canada. The concept for this large repository is based on the design of the Saskatchewan Social Innovation Hub (SSIH), also managed by ISM Canada. The proposal states that ConnectYXE will leverage the security and privacy elements of that design but does not provide details of those security or privacy elements. It is unclear whether the City has assessed, or intends to assess, those existing privacy and security elements to determine if they are appropriate for the ConnectYXE program, in line with current privacy legislation and whether any compensating privacy and security controls will be needed. There is also no indication in the PPIA whether any work has already been undertaken in this regard.

Additionally, the proposal states that all partners who will provide their data to the ConnectYXE program will complete a detailed assessment of their technological maturity and their data. This will allow them to identify whether their data contains any personal information or personal health information so that a PIA can be completed. At this stage, the processes by which any personal information or personal health information will be removed from the data will be identified. Elsewhere in the proposal, on page 59, it states that IT operations will monitor for data and privacy breaches by routinely examining data submitted from partners to identify personal data that may have been inadvertently transmitted to ConnectYXE. Based on this information, even after partners have completed PIAs and their data has been de-identified, there is still a risk that the ConnectYXE program will contain personal information. Again, it is unclear how the City concluded in the PPIA that the ConnectYXE program would not involve any personal information, or personal health information, based on the contents of the proposal.

The last statement in the PPIA states that ConnectYXE will conduct an extensive PIA should the City be a successful winner. It is unclear what the scope of such a PIA would be and why the City has stated it would be required at this stage – given the conclusions in the PPIA. Our office agrees that a more comprehensive PIA, that more accurately describes the personal information to be involved in the ConnectYXE program would be needed should the City be a successful winner. This PIA would need to elaborate on the points of data collection, processing and access and ensure that security assessments and risks are incorporated into the overall assessment of potential privacy risks and compliance with privacy legislation. Furthermore, the comprehensive PIA to be completed by the City should also incorporate the PIAs to be completed by its partners and include an assessment of ISM Canada's role in the program, which at present, is lacking in detail in the proposal and the PPIA

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### ***Legislative Authority***

The proposal and the PPIA do not currently state the legislative authority for the ConnectYXE program as proposed, though the City did provide this information to our office via email correspondence on March 1, 2019. The City indicated that *The Cities Act* provides the authority for the project. Should the City be selected a winner, our office expects that documents related to the ConnectYXE program will identify all applicable privacy legislation and identify the regulatory and legal framework for the project. For example, we would expect a PIA related to the ConnectYXE program to clearly identify the sections of *The Cities Act* and any other applicable law(s) or policy(ies), authorizing the City to collect information from indigenous youth and their families. In addition, the PIA should clearly list all the data elements that would be collected, explain the purpose for the collection of each data element and refer to the specific section of the legislation or regulation that permits the collection of each data element.

Providing this level of detail would allow the City to comply with applicable legal and policy requirements and ensure only the minimum amount of personal information is collected. It would also allow the City to demonstrate how it meets the legal requirements of PART IV Protection of Privacy of *The Local Authority Freedom of Information and Protection of Privacy Act* (LA FOIP), which requires that personal information is only collected, used and disclosed for a purpose that relates to an existing or proposed program or activity.

### ***Integrating security and privacy assessments to appropriately identify and mitigate risks***

As stated in the joint letter to the Minister of Infrastructure and Communities, effective safeguards are especially complex to implement in the smart cities context given the diverse forms of technology deployed. For this reason, it is critical that there be appropriate security assessments undertaken, that complement privacy assessments. The ConnectYXE depends on various technologies and yet the information provided in the proposal and the PPIA related to these technologies was quite limited. There were no copies of existing technical documents, or details of when and how security assessments will be undertaken later. As mentioned in the preceding section of this letter, the ConnectYXE program will be based on the design of the SSIH, which according to the proposal has been audited and approved by the IT Division of the Government of Saskatchewan. The findings and recommendations from those audits were not included in the proposal or the PPIA.

According to the proposal, the ConnectYXE program will also leverage other existing services like the Homeless Individual and Families Information System (HIFIS). HIFIS data are available to the ConnectYXE by an application layer interface that has already been developed though the proposal and the PPIA do not elaborate on the security assessments that may have also already been undertaken in this regard.

Furthermore, the use of Microsoft's cloud solutions to host the environment required for ConnectYXE is involved though again, there are no technical details regarding the use of cloud storage. All connections to systems must be considered in the overall assessment of security and privacy risks and detailed in future security and privacy assessments. Should the City be a winner in the Smart Cities Challenge, we recommend that a future PIA to be developed contain more emphasis on the complex safeguards that will be incorporated into the ConnectYXE program and that the PIA contain evidence in the form of copies of security assessments and other documents to demonstrate the selection and implementation of safeguards.



Given the complexity of the ConnectYXE program and the various technological components involved, it may be more efficient to have a more modular approach for assessing privacy risks by completing one overarching PIA with multiple, more narrowly scoped PIAs to assess individual components. The proposal identifies ISM Canada as the "data custodian" in the ConnectYXE program, which implies ISM Canada will be responsible for the security of data. As such, the City should consider how it will work with ISM Canada to ensure ISM Canada is also conducting appropriate PIAs that will form part of the overarching PIA that the City will complete. The City in this case is ultimately accountable for all aspects of the ConnectYXE program. ISM Canada is the Information Management Service Provider and so should be identified as such in the program documentation. We would encourage the City to contact our office for guidance on how to develop a modular PIA approach for the ConnectYXE program, should the City be selected as one of the winners.

### ***Other considerations***

The proposal lists a number of main stakeholder groups that will continue to be engaged as part of the ConnectYXE program but does not currently list any stakeholder groups that could provide guidance or expertise related to privacy – whether that is in-house privacy resources or our office. Should the City be selected as a winner, we would expect the City to continue to engage with our office and keep our office informed of developments related to the ConnectYXE program. A plan for how the City will engage with our office should be developed and included in any PIA(s) to be conducted in the future.

Page 17 of the proposal provides details of communications plan to be used to create awareness about the ConnectYXE program and used to educate and train partners involved. These plans do not appear to include a privacy component which would be important to ensure full transparency of the information practices that will effect users of the ConnectYXE program. The implementation of free WiFi in targeted areas and communities is a component of the program that may raise concerns from individuals living in those communities about the type of information collected and potentially used about their community and the individuals using the free WiFi. Our office recommends that the City ensure communications plans and any outreach with communities include a discussion on privacy.

It is unclear whether the ConnectYXE program would receive information from partners about individuals who follow through with services requested via the program. For instance, taking the use case on page 5 of the proposal, if a user requests shelter and a meal, it is unclear if the organization(s) providing the shelter and meal will report back to the City about whether or not the user actually followed through with the requests. It would seem useful for the City to know whether the ConnectYXE program is having an impact, though it may involve identifying users and reporting back on those users. This is an area that would need to be further elaborated on in any future PIA(s).

### **CONCLUSION**

As indicated in the preceding paragraphs, the proposal contains information to indicate that there is likely personal information, or personal health information, involved in the ConnectYXE program, although the PPIA concludes that no personal information is involved. Having such conflicting views and conclusions in documents related to the same program makes it difficult for our office to make specific comments about the proposed privacy protections or privacy practices.

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Also, since there were few technical details provided at this stage regarding a program that is almost entirely dependent on technologies, it is also difficult for our office to offer more specific comments regarding the potential security and privacy risks related to those technologies.

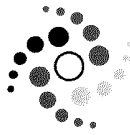
Should the City be selected as a winner, our office recommends that the City resolve the contradicting information in the ConnectYXE program proposal and PPIA so that a more accurate description and thorough analysis of potential security and privacy risks is included in these documents. We also recommend that the City consider the areas outlined in this letter that may need to be further examined via a more comprehensive PIA. Finally, we would like to request that the City continue to engage with our office on developments related to the ConenctYXE program. Our office is always available to offer guidance on PIAs, assessing security and privacy risks and on the requirements of LA FOIP.

We would like to congratulate the City again for being selected a finalist in the Smart Cities Challenge and for the work it has completed to date on the ConnectYXE program.

Yours truly,

Marjorie Platero  
Analyst

cc: Jenny Tremblay, Director General, Smart Cities Challenge Directorate, Infrastructure Canada



# CONNECTYXE

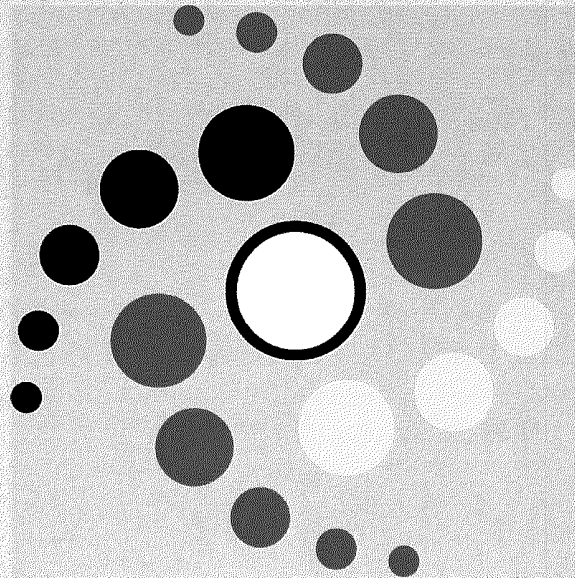
SmartCitiesChallenge





## **OUR MISSION:**

*To be the city that breaks the cycle of Indigenous youth incarceration by creating a new cycle focused on building purpose, belonging, security and identity.*



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# 00 Executive Summary

Our Challenge Statement is to be the city that breaks the cycle of Indigenous youth incarceration by creating a new cycle focused on building purpose, belonging, security and identity.

We worked closely with an Indigenous Youth Advisory Group and with community allies and institutional partners who provide programs and services to Indigenous youth. Understanding and incorporating the experiences and ideas of Indigenous youth is at the centre of this challenge.

The insight that emerged was that the cycle of incarceration begins with a series of harmful decisions. These decisions were often the result of preventative programs and services being too difficult, or unknown to the youth, for them to access in the moment they needed it. By contrast, a series of well-made decisions can give youth a plan and a path to a healthy cycle.

## **A smart city enables its citizens to use technology to make smart decisions.**

The ConnectYXE program described in this proposal uses technology to connect people with programs and services, and to make decisions that will improve their lives. It is a program that supports empowerment, strengthens collaboration and harnesses innovative technology.

**Empowerment of Indigenous youth and their families: providing real time information and options for how to access services throughout the city, every day, all day.** For example, when a youth finishes school for the day, ConnectYXE will give that youth the information to plan out their afternoon and evening: play pick-up basketball in a community gym, have a meal, find a place to sleep, connect with an Elder, and find the public transportation options to reach their destinations.

This information, or the “front-end” of ConnectYXE, will be accessed through a variety of venues ranging from interactive kiosks and public touch screens in malls, stores, and even main transit stops located throughout the city, to a phone app, to a website at a school, or a public library computer. Targeted locations throughout the city will have free Wi-Fi, to ensure ConnectYXE is as available as possible for those critical decision-making moments.

**Collaboration among partners: creating a repository of data of all relevant programs and services available throughout Saskatoon.** Community-based Organizations (CBOs) have been operating in an environment of resource scarcity and fragmented information. Those who participate in ConnectYXE will be provided coordination support and technological capacity to input their activity data into

a data hub, the “back-end” of ConnectYXE. They will be able to access real-time services on an individual use-basis.

**Harnessing innovative technology: connecting systems, sharing data and leveraging artificial intelligence.** The collective data in ConnectYXE will provide a city-wide picture of what is available and the demands on those supports at any time. This enables CBOs, institutional partners, and decision-makers to regularly analyze and to identify gaps, trends, and better ways to respond.

The foundation of ConnectYXE is authentic and on-going engagement with Indigenous youth, community allies and institutional partners. This priority has been built into the governance model of ConnectYXE, with working groups engaging with each other and feeding into a decision-making Council comprised of youth, allies, institutional and technology partner representatives.

A whole-of-community approach, with youth at the centre, is needed to address the complex challenges that urban Indigenous youth face. These challenges are rooted in historical injustices, inter-generational trauma, and racism. And the cycle of family disruption, crime, and incarceration is both a human and economic tragedy that affects the entire city.

Cities across Canada are facing these same challenges, resulting in specific Truth and Reconciliation Commission Calls to Action that address them. Call to Action 38 is: We call upon the federal, provincial, territorial, and Aboriginal governments to commit to eliminating the overrepresentation of Aboriginal youth in custody over the next decade.

The challenge in Saskatoon is profound. Youth incarceration is double the national average. As youth move into the incarcerated adult population, 92 percent are Indigenous men and 98 percent are Indigenous women. The loss in human potential is immeasurable.

ConnectYXE can begin to transform the cycle of Indigenous youth incarceration into a healthy cycle. There is too much at stake if a new cycle is not created.

“  
*If I had ConnectYXE  
I would have been free  
Instead I spent three  
Wasted in a life that truly wasn't me  
Hoping for the best in the future  
I believe this is the true cure  
This is the seed to grow  
a community tree.*”

- MARIO, SMART CITIES YOUTH ADVISORY MEMBER



# 01

## Vision and Challenge Statement

Our vision is to transform Saskatoon into a city where Indigenous youth lead lives with purpose, belonging, security and identity. Our mission is to reduce the incarceration rate of Indigenous youth in Saskatoon to no higher than the rate in the nonindigenous population. Our approach is to empower Indigenous youth, their families and their communities to make smart decisions by accessing critical information in the moment they need it most.

### 1.1 Challenge Statement

**Our challenge statement is to be the city that breaks the cycle of Indigenous youth incarceration by creating a new cycle focused on building purpose, belonging, security and identity.**

Saskatoon is a growing city with a diverse population. On Treaty 6 Territory and Homeland of the Métis, it is the economic hub of Saskatchewan. As in all cities, growth and overall prosperity mask major inequities in both opportunity and outcome. Urban Indigenous youth face challenges rooted in historical injustices, intergenerational trauma, and racism. It is difficult to maintain cultural and spiritual traditions in the contemporary

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a community tree.*

- MARIO, SMART CITIES YOUTH ADVISORY MEMBER

urban setting. Combined, these realities and experiences can deeply affect their sense of identity, purpose, belonging and security.

Among the consequences is an escalating cycle of family disruption, crime, incarceration, and alienation. This is both a human and economic tragedy that affects the entire city. Human potential is wasted. Children are forced to grow up too fast and navigate an often dangerous and hostile environment. Many lack the support or skills to make good choices. The programs and services meant to address these challenges are largely reactive. The criminal justice system warehouses young people in prisons at huge public expense, where they are more likely to become hardened career criminals than rehabilitated citizens.<sup>1</sup>

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1 Government of Canada. Office of the Correctional Investigator. Backgrounder: Aboriginal Offenders – a Critical Situation.

Community-based organizations (CBOs) do their best but the system remains fragmented; there are critical gaps in the capacity to respond to needs in real time, and most of the money is spent on repairing the damage rather than creating opportunities. The cycle becomes normalized and perpetuates itself through generations.

All cities want to solve these problems; in Saskatoon it is an urgent priority.

No one – not the youth and their families, the police and judicial system, CBOs, Indigenous leaders, business leaders – thinks the system is working now. To have different outcomes, we need a new approach. The adverse impact is enormous and will worsen over time. The gap between where we are and what we could be is wide. Therein lies the challenge and the opportunity.

Tragic statistics have spurred the Truth and Reconciliation Commission Calls to Action. Our ConnectYXE program would enable Saskatoon, and many other communities, to make direct progress on the following specific Calls to Action:

**30.** We call upon federal, provincial, and territorial governments to commit to eliminating the overrepresentation of Aboriginal people in custody over the next decade, and to issue detailed annual reports that monitor and evaluate progress in doing so.

**38.** We call upon the federal, provincial, territorial, and Aboriginal governments to commit to eliminating the overrepresentation of Aboriginal youth in custody over the next decade.

These formative experiences replicate in the older adult population, where incarceration rates are at least five times higher than in the non-Indigenous populations.<sup>2</sup>

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<sup>2</sup> Estimates in this section are based on the following calculation: In Saskatchewan about 22% of the on-reserve Indigenous population is aged 10 to 19, of whom 60% are aged 12 to 17, our target population. Applying these figures to Saskatoon's 31,000 Indigenous population yields an estimate of  $(31,000 \times .22 \times .6)$  or 4092 Indigenous youths aged 12 to 17 for 2016.

**4,100**

Indigenous youth in Saskatoon.<sup>3</sup>

**1,721**

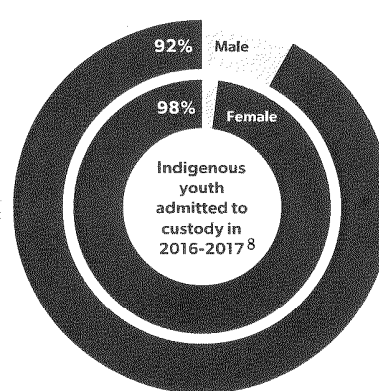
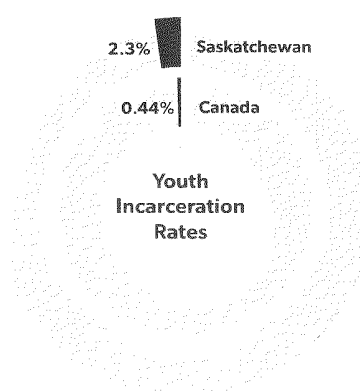
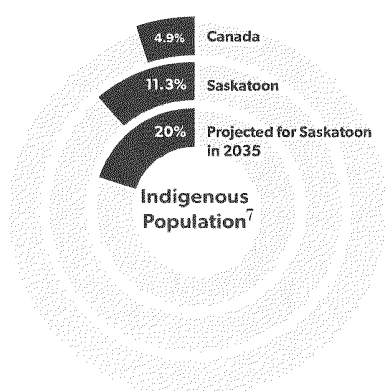
Youth incarcerated in Saskatchewan  
(Youth are ages 12-17).<sup>4</sup>

**3.8x**

Saskatchewan's youth incarceration  
rate is 3.8 times the national average.<sup>5</sup>

**6x**

Likelihood of incarceration of an  
Indigenous Youth as compared with  
non-Indigenous Youth.<sup>6</sup>



<sup>3</sup> Saskatchewan Aboriginal Peoples 2016 Census (<http://publications.gov.sk.ca/documents/15/104388-2016%20Census%20Aboriginal.pdf>)

<sup>4</sup> Saskatchewan stat source: Statistics Canada, Table 11, Admissions of youth to correctional services, by type of supervision and jurisdiction, 2016/2017 National Incarceration Rate for Youth (.44 <https://www150.statcan.gc.ca/n1/pub/85-002-x/2018001/article/54972-eng.htm>)

<sup>5</sup> Saskatchewan rate of youth incarceration is 195 per 100,000 population. Canada is 50 per 100,000, making Saskatchewan 3.8 times the national average. (<https://www150.statcan.gc.ca/n1/pub/85-002-x/2018001/article/54972/tbl/tbl09-eng.htm>)

<sup>6</sup> Jamil Malakieh, Adult and youth correctional statistics in Canada, Statistics Canada. 2016/2017. June 19, 2018. <https://www150.statcan.gc.ca/n1/pub/85-002-x/2018001/article/54972-eng.htm>

<sup>7</sup> Statistics Canada, Census Profile, 2016 Census, Saskatoon City, Aboriginal Peoples. (<https://www12.statcan.gc.ca/census-recensement/2016/dp-pd/prof/details/page.cfm?Lang=E&Geo1=CSD&Code1=4711066&Geo2=PR&Code2=01&Data=Count&SearchText=saskatoon&SearchType=Begin&SearchPR=01&B1=Aboriginal%20peoples&TABID=1>)

<sup>8</sup> Statistics Canada. Table 13 - Admissions of youth to custody, by Aboriginal identity, sex and jurisdiction, 2016/2017 <https://www150.statcan.gc.ca/n1/pub/85-002-x/2018001/article/54972/tbl/tbl13-eng.htm>

## 1.2. The Approach

### **A smart city enables its citizens to use technology to make smart decisions.**

The core of our approach is empowerment: equip Indigenous youth, families and allies with the information and the support networks to make smart decisions. This means that youth and Indigenous culture are central in how we build the technological solution. At our first meeting, the Elder we had invited said we need to find a way to bridge tradition and technology. Doing this will create an environment that enhances the opportunities and outcomes we aim to change.

The complexity of Indigenous youth incarceration cannot be solved by a simple solution. Listening to the voice of youth and their families was our first step. We invited CBOs and institutions who represent and provide services to at-risk youth to work with us. This became a committed coalition of partners. We worked together and with the youth to understand where to start and what could make a difference.

The insight that emerged was that the cycle begins with a series of harmful decisions. These decisions were often the result of preventative services being too difficult, or unknown to the youth, to access. By contrast, a series of well-made decisions can give a youth a plan. As one of the youth advisory members stated, "When we don't have information about where else we could go or what else we could do, we choose Plan A. With infor-

mation, we could choose Plan B. B is for better."

It is in these moments of decision that the cycle of Indigenous youth incarceration can be broken. And based on this, we developed ConnectYXE.

*ConnectYXE is not a provider of front-line services, it is a connector of those services to the youth, families, and allies who need them. It is like an Amazon.ca of services. Through Amazon, you can purchase a product that Amazon does not produce – rather Amazon connects you to the company that produces that service. ConnectYXE will connect people to the services being offered by CBOs and institutions in the city.*

ConnectYXE connects youth, their families and community allies with real-time information on services that are being offered, and the logistics they need to access those services. For example, when a youth finishes school for the day, ConnectYXE will give that youth the information to plan out their afternoon and evening: play pick-up basketball in a community gym, have a meal, find a place to sleep, or connect with an Elder or mentor. ConnectYXE will also provide information on public transportation options to reach their destinations. This information, or the "front-end" of our technology, can be accessed through a variety of venues ranging from interactive kiosks located throughout the city, to an app, to a website at a school or public library computer. Targeted locations throughout the city will have free Wi-Fi, to ensure ConnectYXE is as available as

possible for those critical decision-making moments. Self-determination and self-actualization are critical in supporting youth to make their own decisions.

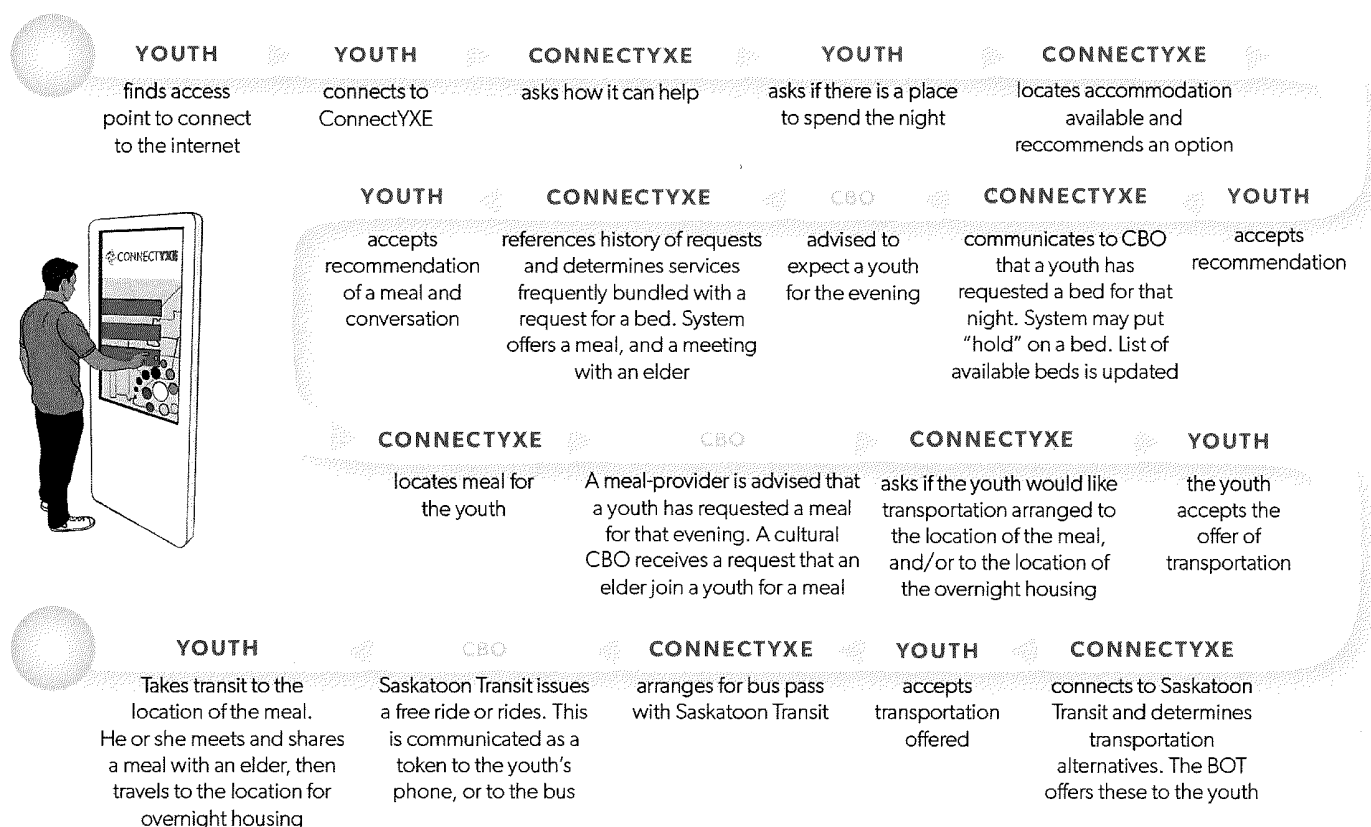
ConnectYXE also provides coordination support and technological capacity to CBOs who have been operating in an environment of resource scarcity and fragmented information. CBOs who are part of ConnectYXE will provide their activity data into a data hub, the “back-end” of our technology. They will be able to

access real-time services on an individual use-basis. In addition, the collective data will provide a city-wide picture of what is available and the demands on those supports at any time. This enables organizations and decision-makers to regularly analyze and to identify gaps, trends, and better ways to respond.

A “Use Case” – a step-by-step narrative that describes user’s interactions with a system – illustrates how ConnectYXE might function.

### 1.2.1 An illustrative Use Case: Youth is looking for short term housing

This illustrates the planned functionality of ConnectYXE using a scenario that emerged from the Youth Engagement Workshops. In this scenario a youth finds for one reason or another that he or she cannot sleep at home for that night.



Our strategic approach is grounded in the following three outcomes. Examples of outputs are included below; a complete picture of how we are measuring outcomes is in the Performance Measurement section.

**1. Empowerment of Indigenous youth and their families.** This includes providing real time information and options on how to access services; ensuring information is available throughout the city, every day, all day. These will be measured by outputs such as: number of queries to the system from public kiosks or websites; number of users; and level of uptake of services.

In the finalist phase, significant progress has been made through consultation with youth to identify what information and services, would make the most difference to how they make decisions.

**2. Collaboration between partners.** This includes creating a repository of data of all relevant services available throughout Saskatoon. Outputs will include: number of CBOs, programs and services in the database, number of partnerships with CBOs, number of trend reports produced.

In the finalist phase, we have developed and strengthened partnerships with both CBOs and institutional partners who have agreed to provide data, participate in our governance, and assist in implementation of ConnectYXE. Their commitments are described in their Letters of Support in Appendix Five. We have also worked with them and the

youth to identify the preferred order of onboarding of services, based on the priority given by youth and the readiness of the partners involved.

**3. Harnessing of innovative technology.** This includes connecting systems, sharing data and leveraging artificial intelligence to:

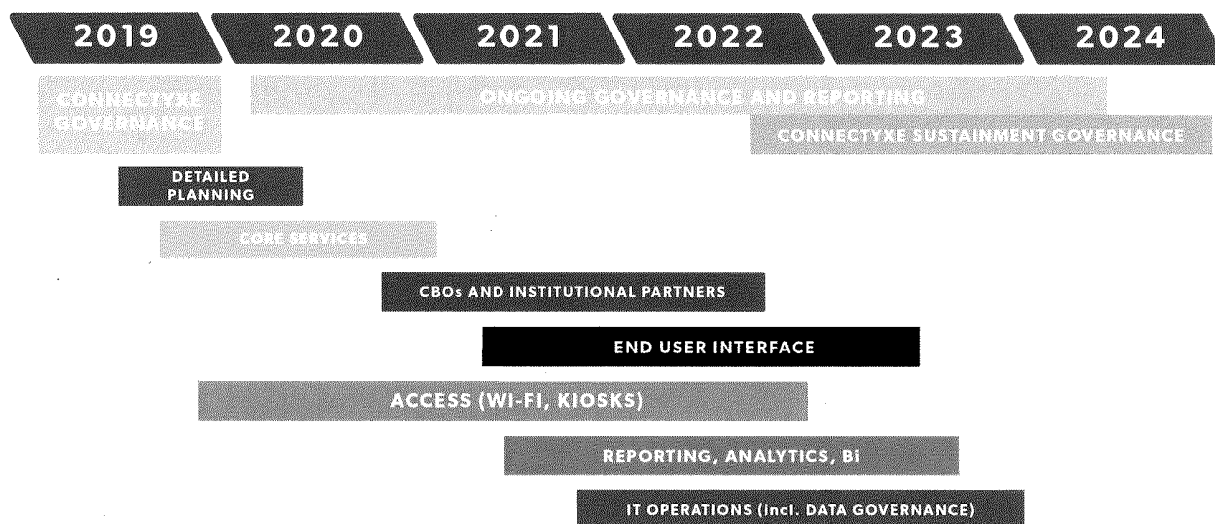
- a. Enhance understanding of support-seeking behaviours and have insight into patterns to improve service coordination;
- b. Enable continuous refinement of programs and services in response to real-time insights generated by ConnectYXE;
- c. Identify critical gaps in programs and services that create barriers to better outcomes.

Outputs include number of community needs reports produced and number of trend reports produced

### 1.3 Implementation Plan

The ConnectYXE Program has a five-year plan. We will first develop our governance structure and processes followed by a detailed analysis of the systems and infrastructure of our CBOs and institutional partners. From this, we will build our core system (the back-end) and the interfaces to connect to and incorporate our CBOs and institutional partners. In a parallel track, we will initiate the projects that deliver the User Interface to youth, their families and allies (the front-end). Real benefits will

begin to multiply as youth are then able to use the system to connect to a growing set of options and services, and as our partners will be able to perform analyses and gather insights based on aggregation of the data. We will build this program to transition to an independent sustainable organization. This figure demonstrates the multiple streams of our plan and the mix of technical and non-technical projects.



FIVE-YEAR IMPLEMENTATION PLAN

## 1.4 Years of Collaboration Is Our Foundation

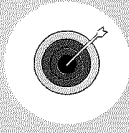
This program is not the starting point; it is the culmination of years of deliberation, community engagement, collaboration, and mobilization. The history of our engagement is detailed in Section 2, “Community Engagement Journey.”

To frame and develop the challenge statement for this program, we designed engagement workshops to identify and prioritize issues and to fuse the narrative of at-risk Indigenous youths with rigorous thinking about pathways to improvement. Over the course of eight workshops we refined the challenge statement into four pillars, developed by the youth and their allies.

Embedded in each pillar is mentorship and culture. Youth recognized that positive adult support, both on a regular basis and in crisis situations, is critical to building capacity to make good decisions. They also expressed a desire to connect with their cultural traditions to strengthen their sense of self and develop a sense of belonging.



**Security:** The overall top priority for the youth. Within that, the main priorities are housing security and public safety. Security also includes food, financial, family security, and accessibility (transportation) to services.



**Purpose:** Helping individuals feel motivated and comfortable, and empowering those individuals to help themselves and others make life better.



**Belonging:** A genuine sense of attachment to important elements of community and how it positively shapes their understanding of self and their place in society. Belonging can refer to any or all of the home, family, community, workplace, and other structures.



**Identity:** Knowing who they are, where they came from; a foundation for self-mastery and pride, expressed in values, personality, sense of autonomy; the product of historical culture, place, inherited and discovered elements; a source of inspiration and strength.

### 1.5 ConnectYXE Program is Transformative, Scalable and Replicable

Our ambition is to change relationships, systems and outcomes. We have designed a program that will be transformational. It is built upon an underlying logic, experience-based learning, and co-design by a diverse and committed partnership. Our approach is both ambitious yet cognizant of the multi-faceted challenges that are part of reducing Indigenous youth incarceration rates.

ConnectYXE program will be scaled up to include more communities, increased CBOs, programs and services, and additional technological advances as we progress. Particularly related to technology, predictive analytics and artificial intelligence are already being used for many

commercial purposes and in everything from health care to transit planning. They are powerful tools for dealing with complexity over time, where effects have multiple causes, key factors interact to magnify socio-economic risks, and individual circumstances can vary greatly from day to day. Scaling our program towards incorporating these technology tools will magnify and expand our impact.

Our challenge is tragically one that many communities across Canada struggle to address. ConnectYXE has the potential to be expanded or adapted to other communities, and to include other related issues.



**Among the main innovations of the program are:**

1. It is grounded by the insight that success comes from empowered youth making good decisions in critical moments. This respects the agency of Indigenous youth.

2. It addresses problems defined and described by the people we are aiming to help: Indigenous youths, their families and allies.

3. It targets an outcome that improves the quality of life for at-risk individuals and their families, and the entire city. Reducing incarceration changes lives, increases safety and well-being for everyone, and reduces costs from the program level up to provincial and federal budgets.

4. It envisions a systems approach to systemic problems. All partners recognize the need to change. They are committed to informed experimentation, evaluation, and agile adaptation.

5. It aims to unleash the power of information at all levels:

a. Create a network of access points that provide vital information for Indigenous youth to get the help they need when they need it.

b. Integrate data to identify at-risk youth, tailor supports to individual

needs, and identify what works, what doesn't, and in what circumstances.

c. Enhance understanding of how Indigenous youth use programs and services to inform decisions about how they might be better organized and deployed.

d. Record and analyze patterns to identify risks, coordinate services, reduce inconvenience and redundancy, and stimulate new approaches. Collaboration and coordination are currently thwarted by the absence of information and connectivity.

6. It is financially feasible and sustainable. It does not require transformational success in a short time period to produce a return on investment.

### **The Economic Costs of Failure**

Continuing the over-representation of Indigenous people in the justice system instead of investing in education and alternative measures will cost Saskatchewan alone as much as \$13 billion over twenty years.<sup>9</sup>

Every youth who gets caught in the cycle of despair and crime costs society an enormous amount of money. **Incarcerating one youth costs the province approximately \$75,000 per year.**<sup>10</sup>

## **1.6 Turning Around Unrealized Economic Potential**

The costs of dealing with the consequences of criminal behaviour are sub-

9 Estimates in this section are based on the following calculation: In Saskatchewan about 22% of the on-reserve indigenous population is aged 10 to 19, of whom 60% are aged 12 to 17, our target population. Applying these figures to Saskatoon's 31,000 indigenous population yields an estimate of (31,000 x .22 x .6) or 4092 indigenous youths aged 12 to 17 for 2016.

10 [http://publications.gc.ca/collections/collection\\_2018/dpb-pbo/YN5-152-2018-eng.pdf](http://publications.gc.ca/collections/collection_2018/dpb-pbo/YN5-152-2018-eng.pdf)

stantial, but the economic impact does not stop there. Far more significant is the lost opportunity to participate in and contribute to the broader economy, which has a direct impact on a youth's sense of purpose, identity, belonging and security. Yet the current trend sees the general population unemployment rate at 5% while the Indigenous unemployment rate is 15.1%.<sup>11</sup>

There is a great deal to do. The Indigenous youth high school graduation rate hovers around 50%. Lifetime earnings double for Indigenous high school graduates.<sup>12</sup> It is estimated that the educational gap between Indigenous and non-Indigenous people costs Saskatchewan over a billion dollars a year in lost economic productivity.<sup>13</sup>

Even a small investment can generate enormous returns. An incarcerated youth conservatively costs approximately \$73,632 a year, and once incarcerated, the likelihood increases that the criminal youth will become a criminal adult. The lifetime costs of further incarceration, addiction services, income support, and other supports reach into the millions. If the program empowers only 3 or 4 of the 4,100 youths each year to choose to complete high school and avoid crime, the combination of reduced costs and positive economic contributions to

society over a lifetime will produce a net benefit in the millions of dollars for each one.

The workforce of tomorrow will have to be significantly Indigenous if the province is to prosper. The problem cannot be quarantined; **the future of Saskatoon, and this nation, is inextricably linked to the future of Indigenous youth.**

### The Case Study of Nanna

The Province of Saskatchewan and our technology partner, Information System Management (ISM), did an analysis of the program usage of one family and the impact on costs. This case study is focused around 'Nanna' who is in her late 50s, has four children, 19 grandchildren and one great-grandchild. Nanna and her children have never been employed. Nanna received support from six different community-based organizations, suffers from depression, addiction, was a victim of abuse and was apprehended as a child. Her family continually struggles with alcohol and drug abuse, domestic violence, child neglect, gang activity and other issues.

The Province and ISM estimate that program costs to support Nanna's family range from \$5-7 million annually and forecasting forward to the next generation this number increases to \$17-19 million. There are 2,500 families like Nanna's in Saskatchewan. This case study emphasizes the urgency of breaking the generational cycle of trauma, both because the costs to sustain people being supported to this extent are significant, and more importantly, the costs to the family in lost opportunity are devastating.

11 <http://publications.gov.sk.ca/documents/15/100460-lfsJuly2016.pdf>

12 Howe, Eric C. *Mishchet aen kishkayhtamihk nawut ki wiichihhtonaan : Bridging the Aboriginal education gap in Saskatchewan*. Saskatoon: Gabriel Dumont Institute, 2011.

13 Soonias, S., H. Exner-Pirot, M. Salat and A. Shah. *City of Bridges: First Nations and Métis Economic Development in Saskatoon & Region*. SREDA: Saskatoon. April 2016.

## 1.7 Bringing ConnectYXE to Our Community

We began our Smart Cities journey knowing we wanted to find a way to address safety and community well-being. Over the past year, we have been inspired by the courage and generosity of the Youth Advisory Group, the dedication shown by the front-line organizations and community allies, and by the commitment of the institutional partners who are prepared to break out of silos and make systemic change. We have built relationships over this past year that will weather the challenges of the future, a future that includes moving forward to build a new cycle of identity, purpose, belonging, and security for Indigenous youth.

*Had ConnectYXE been available a few years back, perhaps my decisions as a teenager wouldn't have been so misguided. I would have had direct access to mentorship, recreation, or even that art class I always wanted to take. Instead of sneaking my friends through the window so they had somewhere to sleep, we could have found a better solution. This technology is going to answer questions we all as youth, struggling or not, need an answer to. It'll guide us places we deserve to be.*

- MORGAN, SMART CITIES YOUTH ADVISORY MEMBER

### ConnectYXE Will Be Built

The experience of the past year with the youth and partners has convinced the community of the important need for ConnectYXE. There has been a commitment made by many organizations in the community to work with the City of Saskatoon in finding a way to deliver ConnectYXE, in all or part, regardless of the Smart Cities Challenge final result.

# 02 Community Engagement Journey

## 2.1 Introduction

Engagement has been and will continue to be at the heart of the ConnectYXE program. We developed our challenge statement as the result of comprehensive community and stakeholder engagement. The success of our program will depend on how well community members are engaged in both the design and implementation. Key objectives are that program and platform models are evidence-based, informed by stakeholder input, and address the barriers and needs of the youth, youth supporters, and community-based organizations (CBOs). Achieving this will require a deep and

*Community Engagement increases community cohesion and allows for the community to have ownership over the outcomes that will ultimately impact them.*

-TAMARACK INSTITUTE

sustained level of community engagement throughout the program lifespan. The governance model as shown in Section 6 “Governance” provides a clear picture of these relationships, and their role in decision-making. This engagement process will continue to involve building relationships, establishing trust and understanding, and continuing communication.

## 2.2 Where We Have Been

The table below outlines key elements of the engagement process to date.

Stakeholder Group	Sessions	Engagement Techniques
Youth Advisory Group	5	<ul style="list-style-type: none"><li>• <b>Sharing Circle:</b> Elder leading a smudge, opening &amp; closing the circle; sharing life stories</li><li>• <b>Scenario Mapping:</b> describing day to day routines in detail to pinpoint and identify gaps and opportunities</li><li>• <b>Priority Identification:</b> arriving at key project priorities, desired purpose and impacts, and key constraints</li><li>• <b>Design Thinking:</b> exercises to encourage creative thinking, and tactile activities such as building their ideal neighbourhood and creating user personas</li></ul>
Institutional Partners Table	4	<ul style="list-style-type: none"><li>• Input meetings<ul style="list-style-type: none"><li>• Discussion around current progress of the program</li><li>• New ideas and feedback on where ConnectYXE activities could be helpful</li><li>• Identifying which administrative units would be appropriate to help out in certain sections</li></ul></li><li>• Governance Planning session to provide input on governance model design</li></ul>
Community Allies Advisory Group (including CBOs)	2	<ul style="list-style-type: none"><li>• <b>Feedback Forums:</b> sharing youth feedback, providing a chance to ask questions and share current work, activities to identify gaps and opportunities, and share new ideas for the challenge</li><li>• <b>Scenario Mapping Workshop:</b> built upon the youth maps, adding comments, questions, and ideas</li></ul>
Technology Advisory Group	2	<ul style="list-style-type: none"><li>• Input meetings<ul style="list-style-type: none"><li>• Reviewed and built upon the ideas developed in the Youth Advisory workshops</li><li>• Added in comments, ideas, questions regarding scenario maps and what types of solutions could be implemented</li></ul></li><li>• Brainstorming session</li></ul>

TABLE 1: ENGAGEMENT PROCESS TO DATE

The program team also conducted eight meetings with individual institutional partners to identify areas of support and collaboration and convened a group of 50 staff and volunteers from 20 different CBOs in the housing and food sector for a presentation and discussion about the project.

To ensure that Indigenous youth with lived experience had a central voice, the team reached out to community groups and agencies. These organizations identified youth with whom they had established relationships and invited them to join the Youth Advisory Group. The

youth represented a range of age, backgrounds and in-crisis experiences. From the beginning, the Youth Advisory Group has involved an Elder and traditional approaches through teachings, sharing circles, and continued support through the process. This intentional approach has built trust between participants and has created a safe space for exploration.

## 2.3 What we have learned

Over the course of the engagement, we identified several key insights that have shaped the current proposal.

Key Insights	Source	How they shaped the proposal
Dependence of youth on several key services – ex. transportation	Youth Advisory Group	Helped to prioritize services and what we should be onboarding first
Importance of traditional knowledge and culture	Youth Advisory Group	Led us to see identity not as a separate pillar but interwoven
Importance and impact of positive adult support for youth	Youth Advisory Group	Reinforced the importance of mentorship as key part of the project strategy
Importance of ongoing communication and relationship building	Institutional Partners	More consistent engagement approach with clear roles, expectations, and responsibilities based on capacity
Need to focus not just on youth as individuals but working with their families and allies	Youth Advisory Group and Community Allies	Important to involve community allies and support systems when working with youth. Our focus went from being simply on youth to understanding the importance of youth supports and allies and how they will also use the technology.
Role of CBOs and differing levels of capacity and technological maturity	Community Allies	Important to respect and reinforce the work of CBOs and their importance to the solution; Created a 3-tiered technology maturity strategy to ensure CBOs are on boarded easily.
Collaboration between technology and community worlds	Technical	To bring the two areas together at an earlier stage to understand the social complexities from the community view and the technological complexities and possibilities from the other side.

TABLE 2: INSIGHTS LEARNED FROM ENGAGEMENT ACTIVITIES

Our team has learned that the different stakeholder groups approach the program from different perspectives, which impacts how we engage them. For example, institutional partners are most focused on big picture strategy, while community allies are most focused on operations, and the youth tend to focus on immediate use and current situations. To address this with CBOs, we started acknowledging their operational realities and shorter-term needs before moving into strategy and vision conversations. We are now customizing our approach to each group. By portraying how everyone contributes to the whole, we have also seen more ownership and empowerment among participating groups.

We must continue to build trust with partners so that they are willing to be candid about their challenges and processes and areas that need improvement. This is essential to design services that will truly work for all users and espouse confidentiality.

## **2.4 Where We Are Headed**

### **2.4.1 Guiding Principles**

We have identified seven guiding principles that will be embedded in the engagement approach. These values will assist in creating meaningful participatory processes and in building ownership within the community.

**1. Inclusivity and Diversity:** Ensuring that all affected and interested groups are involved, with proactive inclusion of groups that may be marginalized or facing barriers.

**2. Honouring Treaty Responsibilities:** Bridging the distance between Indigenous and settler worldviews on wellness of the individual, family, and community. (see Section 11.1 for full description)

**3. Transparency:** Open and consistent communication about the program. Commitment to explaining decisions, why they were made and how input was used.

**4. Deliberation:** Creating environments that encourage sharing, vulnerability, and provide opportunities for participants to shape solutions and work toward consensus.

**5. Influence:** Engagement must inform and shape decisions. Participants understand their level of influence and are involved in the decisions that most affect them.

**6. Accommodation:** Using approaches that will welcome a diversity of voices and ensure convenient, accessible methods of participation.

**7. Ongoing and Iterative:** Engagement continues throughout the project lifespan and will be adapted based on feedback and learning.

## 2.4.2 Decision Making Process – Governance

The Governance model described in Section 6 has a direct connection to the engagement plan. This is because engagement is about working with the community to have ownership over the outcomes that will ultimately impact them. The engagement process is always linked to decision-making, and therefore to governance. As the governance model evolves, so too will the engagement plan.

The ConnectYXE Council is the ultimate decision-maker. The Advisory Groups

and Working Groups are at a collaborate level. There will also be engagement beyond these formalized structures, at a variety of levels. The program team will look to these governance groups for support with designing and leading engagement efforts to ensure they will resonate with the intended participants.

## 2.4.3 Community Relationships

The table below outlines the main stakeholder groups that have been and will continue to be engaged through the course of the program.

Key Stakeholder	Level of Engagement	Engagement Mechanism	Description	Purpose or Role
Youth with lived experience	Collaborate	Youth Advisory Group	15 Indigenous youth representatives recommended by 9 youth-serving agencies in Saskatoon	Provide lived experience voice to share experiences, identify needed supports and prioritize needs; foundational input for the program focus and approach
	Involve	Design and Testing Workshops or Stations	Wider group of Indigenous youth to engage with user experience design and testing	Provide lived experience and user voice to the process, ensure diversity of users are engaged
Government and Public Institutions	Collaborate	Institutional Partners Table	Representatives from 11 public institutions and levels of government, including Indigenous government	Provides overall strategy and approach based on input from lived experience and community, involved in developing governance model
	Involve	Individual Meetings	Meetings with individual institutional partners	To identify areas of program and data support that aligns with the ConnectYXE program
Community Based Organizations & Allies	Collaborate	Community Allies Advisory Group	25 organizations with a primary focus of working with at-risk youth in Saskatoon	To build awareness of ConnectYXE and gather ongoing input
	Involve	Outreach Meetings	Organizations from housing, food, recreation, and cultural sectors	To build awareness of ConnectYXE and gather ongoing input
Technology Partners	Consult	Technology Advisory Group	Representatives of key technology partners	To provide input and guidance with respect to the technology solution
	Collaborate	Weekly Update Meeting	Meeting with ISM as major tech partner	To build on the platform to support development
Residents	Inform	Communication Channels	Communications of key program milestones and opportunities for involvement	To keep interested residents aware of the program, key milestones, and ways to support

TABLE 3: ENGAGEMENT ACTIVITIES

## 2.4.4 Projected Engagement Goals and Activities

The table below outlines projected activities that correspond with an engagement goals. This represents an iterative and agile-thinking approach to the engagement processes.

Engagement Goals	Activities
<b>1. Broaden the base:</b> all appropriate supports and stakeholders are engaged and involved in program development. Active participation of Indigenous-led groups and allies.	<ul style="list-style-type: none"> <li>• Identify and build relationships with Indigenous and community-based service providers, organizations, and allies that have not yet participated.</li> <li>• Reach out to service providers in neighbouring First Nations outside the city to identify possible partnerships and involvement (because of the high rate of migration between surrounding reserves and the City).</li> <li>• Solidify governance model through participatory involvement of stakeholders, and ensure clear understanding of purpose, roles, and responsibilities of various bodies.</li> <li>• Recruit for membership within working groups.</li> </ul>
<b>2. Gain a holistic picture:</b> stakeholders are deeply involved in needs assessment processes to ensure barriers and needs of youth, youth supporters, and CBOs are addressed in the design	<ul style="list-style-type: none"> <li>• Convene collaboration and input workshops with community allies to test the scope of current initiatives and gain feedback</li> <li>• Involve working groups in needs and opportunity assessments</li> <li>• Continue to support youth advisory group and build processes for onboarding new members if there are transitions</li> <li>• See goal #5</li> </ul>
<b>3. Build trust and change-readiness:</b> CBOs see program value, feel respected, and are ready to make changes to support the program success. Participants have trust in the program; are willing to disclose what's not working and to express ideas that may be uncomfortable.	<ul style="list-style-type: none"> <li>• Ongoing communication about program status, opportunities for participation and influence, and next steps.</li> <li>• One-to-one relationship building meetings with CBOs to build deeper understanding of operational realities and to discuss what's working and not working.</li> <li>• Create guidelines for advisory and working groups that emphasize importance of confidentiality, non-judgement, and productive discomfort.</li> <li>• Facilitate a series of workshops that build social capital and trust among participating groups, using a variety of facilitation methods for courageous conversations.</li> </ul>
<b>4. Strengthen community interconnections:</b> enhance awareness and connections between service providers, to promote reinforcing activities and reduce unnecessary duplication. Work in a way that advances community reconciliation.	<ul style="list-style-type: none"> <li>• Through engagement gatherings, create a collective system map of what each CBO is doing, and where there are overlaps, gaps and opportunities.</li> <li>• Broker partnerships and collaborative activities between CBOs, as appropriate, to leverage other strengths.</li> <li>• Convene courageous dialogue about areas of possible duplication or necessary redundancy.</li> <li>• Indigenous inclusion at every layer of the program and its governance, including both membership, cultural protocol, and modern treaty considerations.</li> </ul>
<b>5. Iterate based on testing and feedback:</b> leverage design thinking approaches to put users at the centre of development and iteration. Ensure the right people are engaged at the right time in key design phases.	<ul style="list-style-type: none"> <li>• Build capacity in design thinking methods and tools, increase stakeholder familiarity and comfort with these processes.</li> <li>• Host prototype testing experiences with incarcerated youth, affected families, youth advisory group, community allies, and members of the broader public.</li> <li>• Host feedback forums to gather feedback from institutional partners, subject matter experts, and other key allies.</li> </ul>

TABLE 4: PROJECTED ENGAGEMENT GOALS AND ACTIVITIES



## 2.5 Communications, Marketing and Change Management

Communication to and from the youth, partners, and broader community will be a key activity towards building ConnectYXE success, and organizational and social change. Once ConnectYXE has been identified as a successful program, we will develop a communications plan that will include a news release and media announcement event, social media content shared across the City's Facebook, Twitter and Instagram channels, and updates on [saskatoon.ca/smartcities](http://saskatoon.ca/smartcities).

We will then begin the next steps of program development and implementation. When ConnectYXE is ready to be launched to the community, we will create awareness by using a combination of advertising elements using both digital (social media, search engines, online) and traditional (radio, print, billboards, posters) media.

In the lead-up to the launch, we will work with the youth advisory group to develop plans for how best to reach other youth. We will also work with institutional partners and community allies to identify the best way for them to market ConnectYXE through their networks and how we can support them to do this.

After the launch, we will develop training and resource materials for onboarding additional CBOs to ConnectYXE and use these when approaching targeted groups to invite to ConnectYXE. We will

also host information sessions for the general public to understand how ConnectYXE works, while at the same time using this as an opportunity to test it as part of an on-going iterative development process.

ConnectYXE will introduce a new tool and new ways of thinking about how youth, their families and their allies might find available options and services. The program will be successful only if those end users actually use the service – that is, change how they do things. Introducing a change in the way individuals think and act is the discipline of Organizational Change Management (OCM). The change we seek to achieve is the use of ConnectYXE to make informed decisions.

ConnectYXE incorporates two frameworks to achieve the art and science of OCM: the McKinsey 7S model, and the PROSCII model. These formal methodologies have these broad steps in common:

- We identify what change we are introducing
- We identify who is impacted by the change, and
- We identify who influences whom

Based on this, we then seek to introduce the change in a managed way:

- We start by creating “Awareness” of the change
- We communicate the potential advan-

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tages of the system, to build “Desire”

- Then we provide information as to how to use the system – or to build “Knowledge”
- We work with our users to build skill or proficiency in using the system – or to build “Ability”, then
- We seek to “Reinforce” the newly-learned behavior

This “ADKAR” framework will – like other aspects of the ConnectYXE program -- evolve as we learn from early deployment efforts, as we listen to our end users, and as we monitor and measure the adoption of the solution.

## **2.6 Issues & Risk Identification**

Risk Management cuts across each of the sections of this proposal, and risks frequently overlap domains. We have consolidated the risks, and the discussion of the risk log in Section 9 “Risk Management”. We have provided our current risk log in its entirety in Appendix Four: Entire Risk Log.

# 03 Technology

Using a technology-based solution to address a social issue such as breaking the cycle of Indigenous youth incarceration is ambitious. We believe technology can play a critical role in connecting Indigenous youth, their families and allies, with a wider range of choices, empowering them to make decisions, and to seize existing opportunities. Technology can be a tool to help connect them to people, programs, and activities related to their cultural identity, that enhance their sense of life purpose, that give a sense of belonging, and provides security.

## 3.1 What is ConnectYXE? An Overview of the Technological Solution

ConnectYXE is both a data hub of programs and services (the back-end) as well as multiple interfaces for youth, their families, their allies and service providers to access those programs and services in real time. For example, access to the service will be available using a phone, a computer in a public library, or a public touch screen in a mall (the front-end).

Each Community-Based Organization (CBO) and institutional partner presently provides a subset of these services for youth and their families. However, they often work in isolation. ConnectYXE will collect existing programs, services and capacity information and connect it to youth, their families and their allies, in

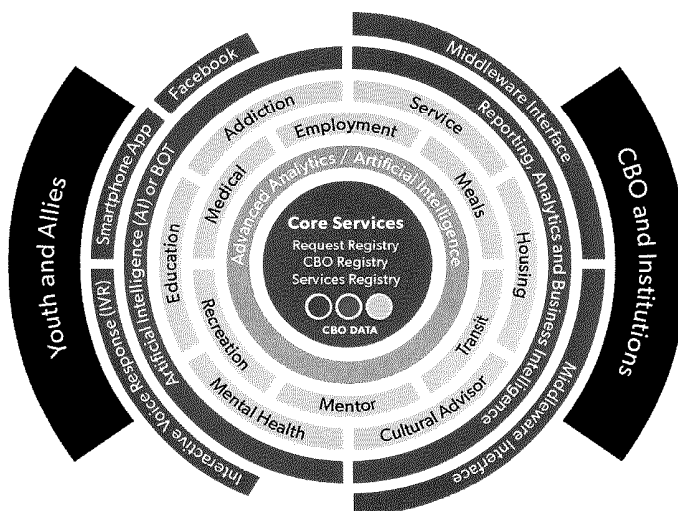


FIGURE 1: CONNECTYXE INTERFACE LAYERS

the moments they need it most.

Through analytics, ConnectYXE will provide a city-wide picture of what services are available and the demands on those supports at any time. This can be used by organizations and decision makers to identify gaps, trends, and opportunities, and recommend policy and program changes.

In this section, we explore each of the elements of the technological solution shown in the image, and “build” the system conceptually layer by layer.

We discuss data and privacy in detail in a subsequent section, but at this point we are clarifying that we will not collect data that contains personally identifiable information (PI) or Personally Identifiable Health Information (PHI).

### 3.1.1 Core Services

The core of ConnectYXE is a repository of data from CBOs and institutional partners, services those organizations offer, and a repository of requests. Data from CBOs and institutional partners reside here in the form in which it was received from the partner organization. This design is modeled after Saskatchewan's Social Innovation Hub (SIH), developed with our technology partner, Information System Management (ISM).

**Detailed planning of the system core will include several elements:**

- **Core Services** provide access to the system for administrators and partners. A secure process to log into the system will allow administrative users to access their own data. Authentication (that is, who logs into ConnectYXE) is discussed in Section 7.2 "User Access".
- **Requests** collect the metadata associated with requests by youth, their families and their allies. Collecting and analyzing this data can identify metrics associated with the system, which will help CBOs determine services that are most in demand and those service requests that most often cannot be met.
- **A Registry of CBOs** collects key organizational data about the CBO. This information is used to implement and maintain interfaces as a part of the Core Services.
- **Contacts** are integrated to both the authentication service and the repository



FIGURE 2: CORE SERVICES

#### Is ConnectYXE a Tool for Case Management?

The design outlined in this section specifically calls for a system in which the identity of an end user is not identified. While we recognize potential benefits of tracking and recognizing trends in the interactions of an individual, respect for the privacy of the end user has prevailed. The system is *not* designed to be a Case Management System.

of CBOs. This data will maintain roles and contact information.

- **CBO Data** is provided by CBOs and partners in their own format, sidestepping a long and difficult effort by each partner to transform into a highly structured/normalized model. *Note: Each CBO's data is isolated from other CBO's data. Staff from a given CBO will be able to view only their own data.*

### 3.1.2 Core Interface with Advanced Analytics

Advanced Analytics are built into the Core Services of ConnectYXE through the Registry Interface. This interface includes enhanced Artificial Intelligence (AI) – a variety of AI tools – to bridge the gap between data received from CBOs and the services offered by ConnectYXE.

Data provided by CBOs and institutional partners stored in the core will be both structured and unstructured. Highly structured and normalized data, for example, is housing data or data about recreational services stored in a database. Highly unstructured data might be published in a document or maintained on a spreadsheet that is stored on a server or on a local workstation of a CBO.

Knowledge from this data will be ex-

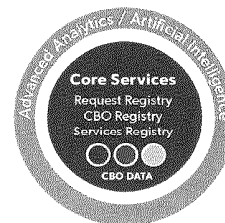


FIGURE 3: CORE INTERFACE WITH ADVANCED ANALYTICS

tracted using a set of Advanced Analytics tools and methodologies. This approach is trusted and used in a similar fashion to extract meaning from disparate data sets in the Saskatchewan Social Innovation Hub. AI is used to help deliver the right information, at the right time.

### 3.1.3 Services Offered by CBOs

The primary function of ConnectYXE is to connect organizations providing services to Indigenous youth and their families. These service connections will live in the Services layer of ConnectYXE. This information is populated by the Advanced Analytics Interface from CBO data maintained in the core.

Initially the services provided will start with Meals, Housing, Transit, Recreation, Cultural Interactions, and Mentorship. Additional services will be added as CBOs are on-boarded under the direction of ConnectYXE program governance.

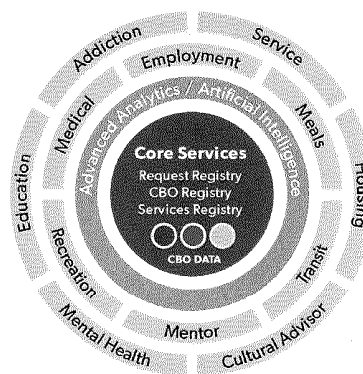


FIGURE 4: SERVICES ONBOARDED

### 3.1.4 A Public Request Interface Enhanced Through Artificial Intelligence

A Public Request Interface is where youth who are requesting services can interact, make requests, and receive context-sensitive information to enable them to make informed decisions. It acts as a layer brokering the interactions between the youth and the services. This public layer is enhanced by a Chatbot utilizing Natural Language Processing (NLP) and other forms of Artificial Intelligence (AI).

This feature is a differentiator of this proposal. It allows users to interact with the system in language and terminology that is meaningful to the youth. Whether the youth is speaking to the system using a phone or is “talking” to the system using text, the Chatbot can be a primary handler of conversational interactions.

Chatbots are becoming more prevalent. Apple’s *Siri*, Amazon’s *Alexa*, Microsoft’s *Cortana* and Google Assistant are ex-

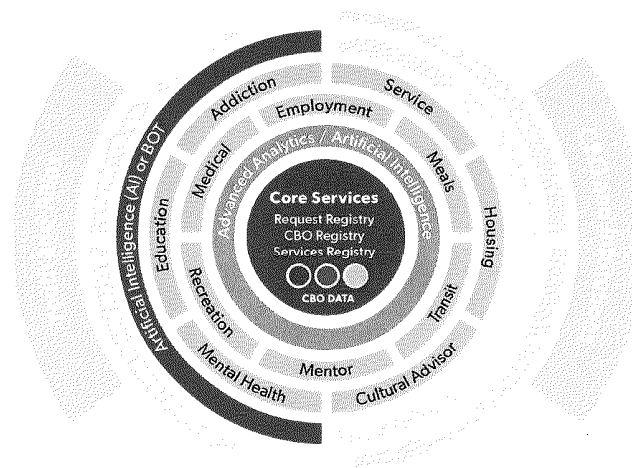


FIGURE 5: ADDITION OF ARTIFICIAL INTELLIGENCE

amples of interfaces that are on a smart phone or voice-activated personal assistant, or as a first encounter in calling customer service at several companies.

A Chatbot can be implemented in multiple languages. Future iterations of ConnectYXE may provide access in French. As the vision of ConnectYXE is scaled beyond the immediate objectives, the front end can be enhanced to speak other languages.

### 3.1.5 User Front End

A layer of web services wraps the public request interface to provide a seamless experience connecting the user to the service they need. Social Media and interactive voice response will allow youth, families and allies to interact with ConnectYXE by whatever method suits them. Together, with the front-end options and the Chatbot, information on programs and services will be available 24/7 with an interactive experience.

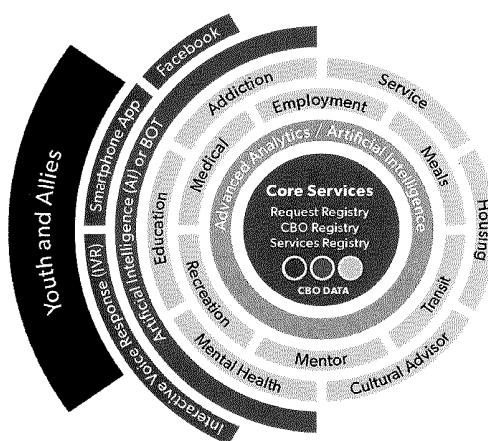


FIGURE 6: USER FRONT END

## ConnectYXE Public Interface Uses Two Forms of Artificial Intelligence

Artificial Intelligence, or AI, is used in two distinctive ways in ConnectYXE's Public Interface.

The AI Chatbot handles the phrasing and conversational interaction, working with short, snippet-based conversation. Examples are phone calls, text message or a Facebook conversation or post. It uses Natural Language Pro-

cessing and can "learn" from previous conversations.

The second AI dimension is learning what a person is looking for, even when they have difficulty articulating their needs in terms of services. Here, AI tools search for relationships in data. This is Advanced Analytics or machine learning applied to the ConnectYXE context.

In ConnectYXE, data will be analysed by a rich set of analytic tools in the ISM Data Lab. The richness of the analytics, too, grows over time.

### 3.1.6 Operations Interface Supporting Reporting, Analytics and Business Intelligence

ConnectYXE includes an operations interface comprised of reports, analytics and business intelligence (BI). This interface includes prepared reports that will be available to authorized partners (e.g. CBOs, institutional partners, etc.) This interface layer will support the exchange of data between ConnectYXE and each partner.

ConnectYXE partners – CBOs, Institutional partners, policy makers and researchers will connect to these reporting, analytics and BI services through a web portal. They will have access to information that is related to their services that will allow them to understand the efficiency of the programs they provide, and also understand the landscape of the entire city to understand what the needs are of at-risk youth. This allows them to understand the funding required to run their programs and which social services are at greatest demand. The intelligence gathered will allow us to position social services funding to optimal advantage.

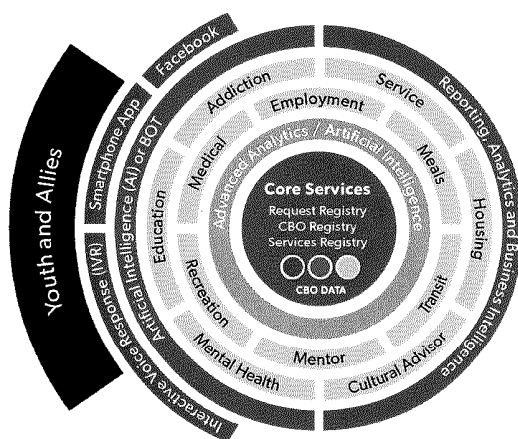


FIGURE 7: ADDITION OF OPERATIONS INTERFACE

**A report is analogous to driving a car while looking in a rear-view mirror while Business Intelligence is analogous to looking through the front windshield.**

## A Partnership with Saskatoon Housing Initiative Partnership (SHIP)

The Government of Canada National Homeless Individuals and Families Information System (HIFIS) has developed a software solution to enable CBOs to manage shelter and food services, and to share and collaborate their current status and use. In Saskatoon, SHIP is working to promote the use of the current version of HIFIS. CBOs that sign-on with HIFIS publish available shelter space and meal infor-

mation. This makes SHIP an ideal partner for ConnectYXE-IFIS data are available to ConnectYXE by an Application Layer Interface (API) that has already been developed. This means that the rich dataset maintained by HIFIS for shelter housing and for meals is available to ConnectYXE.

Conversely, ConnectYXE promotes the objectives of SHIP and works to promote the adoption of HIFIS 4.0. As ConnectYXE onboarding process identifies CBOs that do not have a technical solution to managing services, the program will work with HIFIS to meet that need.

### 3.1.7 Middleware Connector

A middleware layer will connect the data repository to ConnectYXE partners. This is a set of APIs that pull data from our partners' data sources. The nature of the interface will depend on the level of IT maturity of the CBO or institutional partner. Each partner will have a different level of technological maturity. This is discussed further in Section 3.5 "Technical Onboarding of CBOs and Providers".

ConnectYXE is not imposing a standardized, normalized data model on its partners. The approach described above proposes to receive data as it is available, and using AI, will extract information that can be provided to the users of the service. This data will be received by the system by creating APIs. Collectively, these APIs can be thought of as comprising a "Middleware" between the partners and ConnectYXE.

Data provided to the system from the CBOs and institutional partners will be stripped at the source of any PI/PHI.

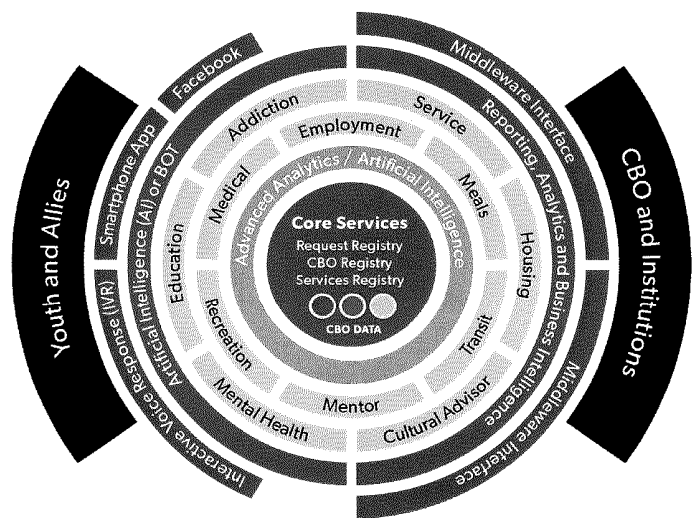


FIGURE 8: FULL FUNCTIONING CONNECTYXE SYSTEM



## ConnectYXE and 211 Saskatchewan

The Province of Saskatchewan has implemented 211 Saskatchewan "to be THE provider of real time community information and referral in Saskatchewan."

211 Saskatchewan is a free, confidential, 24/7 service that connects individuals to human services in the province by telephone, text, or web chat, plus a searchable website with over 5,000 listings of social, community, non-clinical health, and government services across the province.

This service is available by voice or text, from a phone or computer, and is available 24 hours a day, 365 days a year in 100 languages, including 17 Indigenous languages.

ConnectYXE is different from 211 in that ConnectYXE connects to the services offered by partner CBOs – in addition to connecting the individual to the CBO. ConnectYXE will collaborate with 211 Saskatchewan in three ways:

- ConnectYXE will connect to 211 Saskatchewan, facilitating an additional means of access to this service;
- 211 Saskatchewan data will be connected to ConnectYXE so that it is accessible by the analytical and AI tools of the ISM Data Lab. This will provide a rich source of data to match requests for services with ConnectYXE user's requests; and
- 211 Saskatchewan will be onboarded as a partner CBO, providing 211 with access to the services offered by constituent ConnectYXE CBOs.

### 3.1.8 Public Access Kiosks

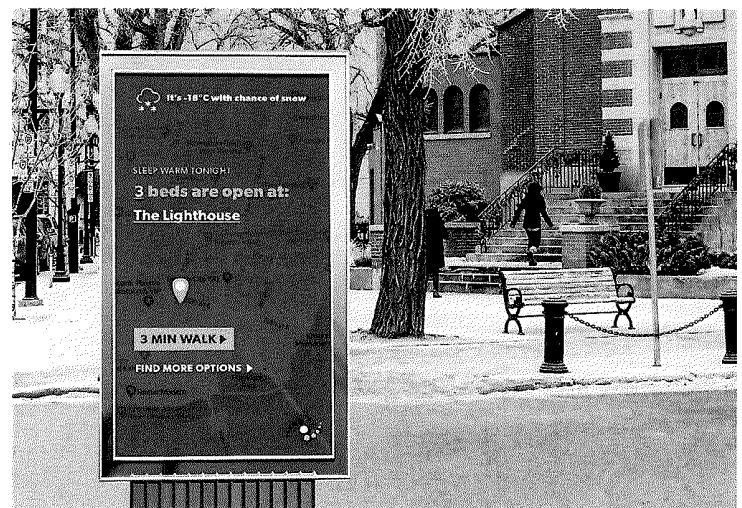
Public kiosks will be strategically placed throughout Saskatoon where Indigenous youth meet and congregate. These will present information about programs, services and transit information.

The potential for public kiosks beyond the ConnectYXE program is significant. They can be integrated with current events to promote tourism, and to advise of public services. These would provide the justification for an independent sustainable organization to advance the number of public kiosks beyond what would be funded by the program. We will monitor the use of the initially-provided kiosks as input for a business case to leverage public funding to extend this service.

### 3.1.9 Internet Exchange

CIRA (Canadian Internet Registration Authority) is a non-profit organization

that manages all .CA domains in Canada. One of the goals of CIRA is to keep internet traffic within Canadian borders. The City of Saskatoon is a member of the Saskatoon Internet Exchange. The goal is to ensure all communications (internet traffic) between CBOs and ConnectYXE is within Canada. Combined with all data residing in Canada, we have an opportunity to keep all interactions in Canada.



SAMPLE OF CONNECTYXE PUBLIC ACCESS KIOSK

### 3.1.10 Free Wireless Internet to Strategic Locations

Another aspect to improving access to ConnectYXE is to enhance the opportunities for connecting to the Internet in locations where Indigenous youth and their families are likely to be. We know that Wi-Fi access is a limiting factor for many youth who have access to a smart phone, but cannot afford monthly data plans. Current practice is for these youth to hang around schools after hours where they can get a Wi-Fi signal.

Providing broad public Wi-Fi access throughout Saskatoon is beyond the scope of the ConnectYXE program. The ConnectYXE program will improve Internet access by placing wireless access points in neighbourhoods that we identify as having a high concentration of Indigenous families, combined with socioeconomic indicators that indicate high rates of poverty. Using the Stats Canada data overlaid with Geospatial data we have determined where Indigenous families with the lowest income are located. The map shown here illustrates this approach. We will install Wi-Fi Access Points (WAPs) on light standards in one of these neighbourhoods and then use results of utilization of this service to build a business case to secure funding to extend it to additional neighbourhoods.

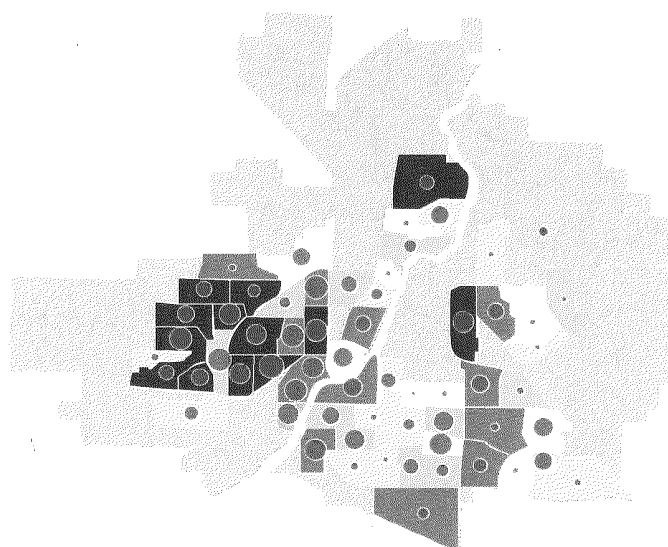


FIGURE 9: WI-FI ACCESS POINTS IN CORE NEIGHBOURHOODS

### 3.2 Storage and Application Infrastructure

Access to ConnectYXE is required 24/7, comparable to emergency services. We will leverage Microsoft's Cloud solutions to host the environment required for ConnectYXE. This solution keeps all aspects of the solution within Canadian borders and allows ConnectYXE to be scalable across Canada. Microsoft's Cloud solution includes disaster recovery, backup/restore, archiving, auditing and redundant Internet services. With a high level of redundancy, this will ensure that ConnectYXE users will have a consistent experience.

### 3.3 Getting Connected to ConnectYXE

ConnectYXE will be valuable to youth, families and allies only if they have the devices to access the system, and if there is an internet connection available. ConnectYXE will address this by increasing the points of access to the system. ConnectYXE will:

1. Provide enhanced access to free Wi-Fi,
2. Place kiosks strategically throughout the city,
3. Be promoted on existing computers in schools and libraries,
4. By text or by voice using an individual's own device, and
5. (In the future) provide free Wi-Fi on public transit

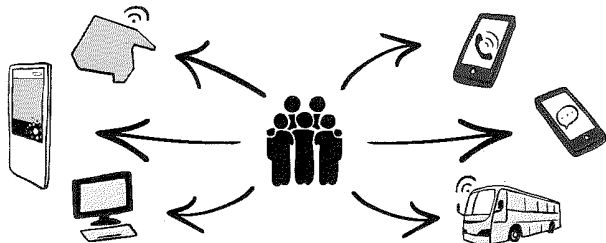


FIGURE 10: CONNECTING TO CONNECTYXE

### 3.4 IT Governance

IT Governance fits within the context of the overall Program Governance. In the governance model proposed, the execution of the program will reside with a Program Team, led by a Program Di-

rector. That team will deliver projects as directed by the ConnectYXE Council (documented in Section 6) and will provide IT Operations support (see Section 4.7 "Transition to Operations").

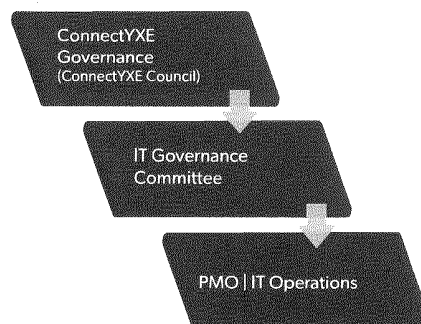


FIGURE 11: IT GOVERNANCE

The system delivered by ConnectYXE requires IT Governance to ensure the IT operation is compliant with legislation, regulations and privacy. IT Operations will be responsible for Data Governance, including data retention and disaster recovery. IT Operations is responsible for ongoing financial accountability, preparing ongoing operating budgets and applying accounting regulations to costs and expenditures.

The IT Department of the sponsoring organization – the City of Saskatoon – employs an ITIL-based Governance framework and uses IT Service Management. The City has offered an instance of the ITSM service as an in-kind contribution to ConnectYXE.

### 3.5 Technical Onboarding of CBOs and Providers

There are two dimensions to the onboarding of a CBO or of an institutional partner: one is the onboarding of the partner at an organizational or partnership level. This is a product of engagement and is managed by ConnectYXE Program Governance. The second dimension is to establish a project to onboard the partner at a technical level.

**CBOs can be broken into three broad categories:**

- **“No Tech”** organizations present different challenges. These are CBOs who do not have data in a form that can be shared. For these, the onboarding process will work with the CBO to establish basic administration of the services offered. Some funding will be allocated to this purpose. For these CBOs, our agreement will include supporting them to establish IT systems as appropriate. Once systems are developed, these CBOs may

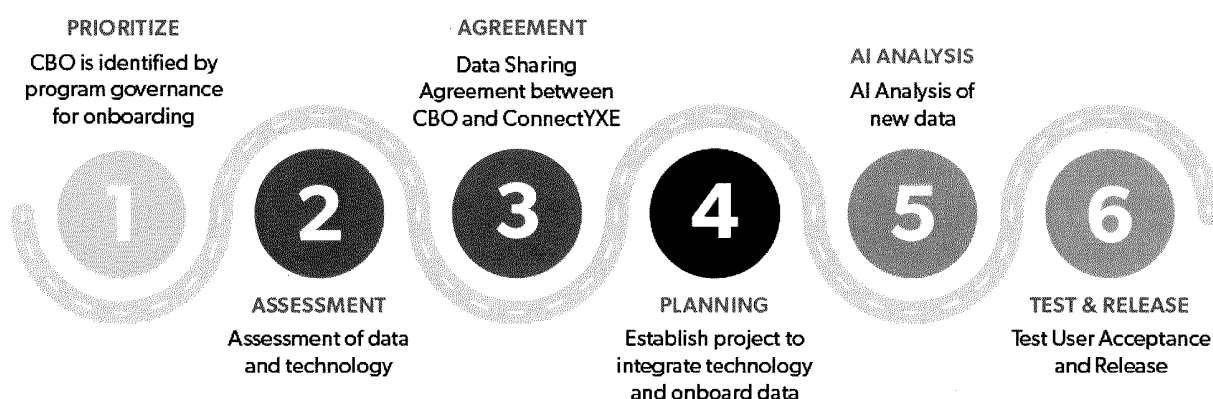
then be integrated into the ConnectYXE system.

- **“Low Tech”**: These are CBOs who have basic IT technology. For example, they may manage their services using spreadsheets or a local database. Data from these CBOs may be integrated into ConnectYXE.

- **“High Tech”**: Institutional partners have well-developed IT infrastructure in place and can be considered “High Tech”. For example, Saskatoon Transit, City of Saskatoon Recreation and Community Development, Saskatoon Public Schools and Greater Saskatoon Catholic Schools have existing mature systems with which we can build interconnections. CBOs that use HIFIS are also “High Tech.”

**The roadmap provided below will vary depending on the CBO and their level of technological maturity, but will generally follow this roadmap:**

#### Community-Based Organizations Onboarding Roadmap



**1. Prioritize:** ConnectYXE program governance will identify that a CBO is a candidate for onboarding. This process is managed by the Portfolio Management Process discussed in Section 4.6 “Program Governance.”

**2. Assessment:** We will complete a detailed assessment of the CBO’s technological maturity and of their data. This will include identifying whether the CBO’s data includes, or is likely to include, any PI/PHI.

**3. CBO Agreement:** The CBO and ConnectYXE will complete an agreement that includes a Data Sharing Agreement and a Privacy Impact Assessment.

**4. Planning:** The CBO and ConnectYXE will charter a project to onboard the CBO. This step completes the planning for the onboarding, complete with a project team from the CBO and ConnectYXE. Planning will include identifying the process(es) by which any PI/PHI will be removed from the data sent to ConnectYXE.

**5. AI Analytics to Extract Services:** Once CBO data has been onboarded and resides in a secure partition, the AI Toolkit of the ISM Data Lab will begin to extract meaning from it – which will populate the services that end users will access.

**AI Analytics to Provide Insights:** This same ISM Data Lab will, once it has a sufficiently large set of data, analyze the aggregated data, producing trends, deeper analysis and insights.

**6. Testing and Release:** Once the new data has been tested by the CBO and other User Acceptance Testers, the data will be made available to the youth, families and allies of ConnectYXE.

### 3.5.1 Integration with CBOs and Institutional Partners

ConnectYXE does not replace nor compete with applications delivered or being developed by other partner organizations. ConnectYXE will connect users to other partner applications. Here are a few examples:

CBO/Institutional Partners	Technology Integration
<b>211 Saskatchewan</b>	211 Saskatchewan (S211) maintains a database that connects individuals with over 5000 agencies and social services. It provides access to this list of services 24 hours a day, every day, by voice (dial 211), text (text to 211), or as a web chat. This database has a published API with which ConnectYXE will directly connect. As discussed, partnering with S211 provides a “safety net” such that users who cannot otherwise find a ConnectYXE service can connect – in real time – with S211. ConnectYXE can be configured to seamlessly connect to 211 Saskatchewan – either text or voice.
<b>HIFIS</b>	The Homeless Individuals and Families Information System (HIFIS) is a federal government system, providing real-time information about emergency shelter and food services. This system has a published API with which we can integrate ConnectYXE.
<b>Central Urban Metis Federation Inc.</b>	CUMFI uses HIFIS and is moving to HIFIS 4.0 for all of their locations. There is an opportunity for ConnectYXE to expand other services that CUMFI offers, an example is laundry.
<b>EGADZ</b>	EGADZ maintains a SQL database stored on servers at Innovation Place. They currently have an interface used by outreach workers that provides ConnectYXE an integration opportunity. Integrating with EGADZ, we can tap into services that it provides – for example, the “I am not for sale”, or the “runaway” apps.

<b>Saskatoon Transit</b>	Saskatoon Transit is a major institutional partner. Through the API to their TRAPEZE system, we can provide real-time transit information. Through ConnectYXE, we can connect to, and use "Trip Planner". Of particular significance, we can provide pre-paid transportation, using new functionality coming with the "Mobile Ticketing" feature.
<b>Saskatoon Recreation and Community Development</b>	ConnectYXE can connect to City of Saskatoon Recreation and Community Development systems, to provide real-time access to drop-in programs, longer term recreational opportunities and other services.

TABLE 5: TECHNOLOGY INTEGRATION WITH CBOS

### 3.5.2 Technical Collaboration Partners ISM and the Social Innovation Hub (SIH)

ISM Canada is the major technology partner in the development of the Saskatoon Smart Cities Challenge and will be the major contributor of the technical solution of ConnectYXE. The design of ConnectYXE is based on the design of the existing and successfully deployed Social Innovation Hub (SIH), as mentioned earlier. ISM Canada, in conjunction with the Government of Saskatchewan, has invested significant research and development over the past two years to create this innovative data hub in the social sector.

### 3.6 Scalability, Replicability and Future Proofing of the ConnectYXE Design

The ConnectYXE program has been developed to meet the needs of Indigenous youth in Saskatoon. However, the design is:

- **Scalable** – that is, it can be extended to meet the needs of other marginal communities in Saskatoon;
- **Replicable** – it can be applied to other cities in Saskatchewan, in Canada, and globally; and
- **Is "Future-Proof"** - it will only improve as AI tools, Natural Language Processing Tools and other technologies emerge.

#### 3.6.1 Scalable

The proposed design can be scaled to ben-

efit other communities than the initial target community of Indigenous youth. What tailors the system to Indigenous youth is the fact that services identified by the Youth Advisory Board are those services that will be on boarded and in the priority identified. Other related services can be added as needed.

#### 3.6.2 Replicable: A Framework for Canada

The specific data collected by ConnectYXE will apply to Saskatoon and people moving to Saskatoon. However, the system as designed has a much broader reach. The solution is built on the ability for any service provider to be added. This framework approach allows any city in Canada to add their services.

Part of what makes this solution replicable is that it is cloud based: it is not contingent on a locally-placed server infrastructure. This solution can be scaled upwards to meet the needs of other cities in Saskatchewan, in Canada, and globally.

### 3.6.3 Future Proof

AI is emerging as a technology that is bringing new capabilities and automating tasks that humans currently do. Institutions and businesses around the world are increasingly using AI for a multitude of purposes including medical diagnosis (e.g., IBM Watson), analysis of “big data” for purposes of marketing, or for stock optimization to mention only a few examples. ConnectYXE seeks to use the same technology to address a social challenge.

Future improvements to AI and to Natural Language Processing (NLP) are coming rapidly. We have seen firsthand NLP provide translation between languages. In the future, we anticipate support for local Indigenous languages

The technology incorporated in the design of ConnectYXE is best practice, available, and used in other industries today. What distinguishes ConnectYXE is what the technology is being used for, how the application will make itself available and accessible to those who will benefit from the service, and the

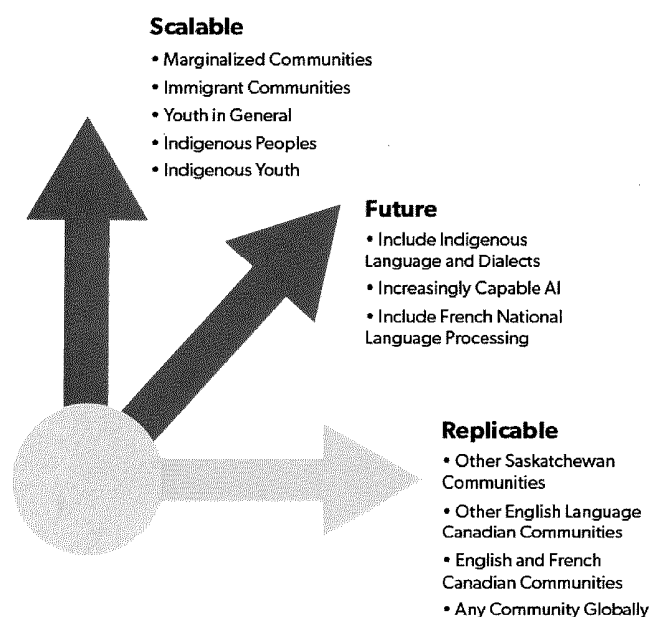


FIGURE 12: FUTURE EXPANSION OF CONNECTYXE

provision of powerful and meaningful analytics delivered to stakeholders.

## 3.7 Risk Management

Risk Management cuts across each of the sections of this proposal, and risks frequently overlap domains. As a result, we have consolidated the risks, and the discussion of the risk log in Section 9 “Risk Management.” That section shows those risks that, overall, received the highest impact profile: we have provided our current risk log in its entirety in Appendix Four: Entire Risk Log.

# 04 Project Management

The ConnectYXE Program is a collection of coordinated projects. Together they deliver a technology-based solution to break the current cycle of Indigenous youth incarceration by connecting those youth with a wider range of services and options.

The Smart Cities Challenge award, combined with contributions by our partners, will not provide us unlimited resources. Therefore, program planning will balance dual requirements: to onboard services provided by CBOs and our partners; and to provide access to youth and end users. An emphasis on one of these at the expense of the other will result in an incomplete solution. Maintaining this balance and ensuring that the program delivers the services that are priorities is the ongoing responsibility of Program Governance.

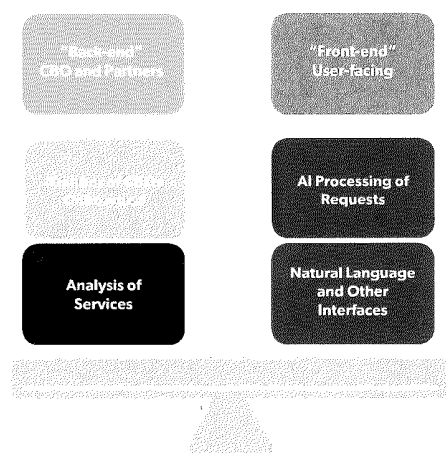


FIGURE 13: BALANCE OF FRONT END AND BACK END SYSTEM

In this section, we discuss our overall approach to the program, our detailed plan, our program and project management approach, and methods and tools that will be employed.

## 4.1 Project Approach

The ConnectYXE program will consist of multiple streams, each with component projects. The projects are a mix of technical and non-technical. The approach, at a high level, is demonstrated in the graphic on the next page.

Upon receiving the Smart Cities Challenge award, we will enter into a formal agreement with Infrastructure Canada and immediately move to establish the ConnectYXE Council and other governance bodies, and develop the core Program Team. We anticipate being able to add some access points as early as 2020. We will enter into formal agreements with our CBOs and institutional partners, based on a detailed understanding of their systems and services that feeds into a detailed integration plan and onboarding process ("roadmap"). We will procure the remaining IT resources needed.

We then move into a period of system development where we will acquire our infrastructure and build the core. Next we begin to connect to, and import data



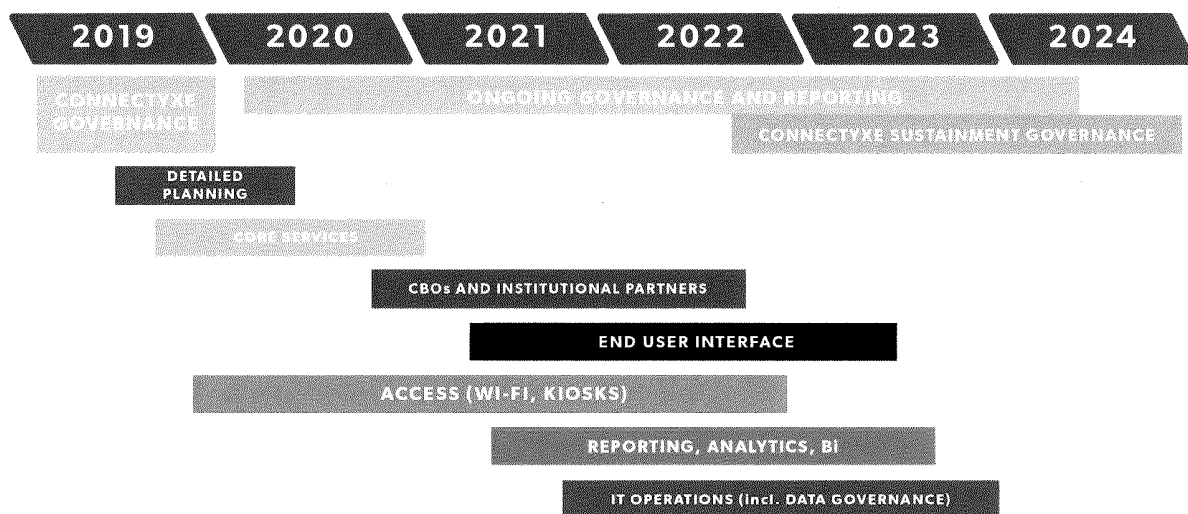


FIGURE 14: FIVE-YEAR IMPLEMENTATION PLAN

from, our CBOs and institutional partners, and build out the user interface – including the Natural Language Processing component. These components will be developed with an agile project management methodology (described later in this section), ensuring end user participation in the project teams. When we have a functioning system available for user acceptance testing, we will begin to promote the system to youth.

Reporting, analytics and business intelligence is a stream that will begin when we have our core built and a sampling of CBO and institutional partner data. It will continue as we engage with end users so that the system will provide insights.

We will form an independent sustainable organization to take ownership of ConnectYXE after the period of Smart

Cities Challenge funding and secure ongoing funding for this organization. As each separate project delivers functioning components of the system, IT Operations will own these, ensuring that they are managed and supported for our partners. IT Operations will transition to the new organization as the program ends. We will formally close the program – working with Infrastructure Canada to ensure the insights, tools and solutions are available to be applied throughout Canada.

ConnectYXE will live on after the period of the Smart Cities Challenge-funded program. The independent organization will continue to develop the solution, add partners, reach out to youth, and operate the service.

## 4.2 Program Scope

This is a high-level scope of the ConnectYXE Program.

Program Phase	Major Deliverables
<b>1. Establish Program</b>	<ul style="list-style-type: none"><li>• ConnectYXE Council Established</li><li>• Recruit Staff Positions</li><li>• Program Governance Committee Formed</li><li>• Formal Agreement with Smart Cities/Infrastructure Canada</li></ul>
<b>2. Stakeholder Engagement and Detailed Planning</b>	<ul style="list-style-type: none"><li>• Detailed Scenario Mapping with Youth and other partners</li><li>• CBO Detailed Requirements Gathering</li><li>• Detailed Solution Planned</li><li>• CBO On Boarding Roadmap Delivered (includes PIA and Data Sharing Agreement)</li><li>• Technology Resources Procured</li></ul>
<b>3. Platform and Core Services Delivered</b>	<ul style="list-style-type: none"><li>• Infrastructure Procured and Developed</li><li>• Core Services Establish (Requests and Services)</li><li>• APIs Developed</li><li>• Connection to ISM Data Lab and AI Analysis</li></ul>
<b>4. CBO and Institutional Partners On Boarded</b>	<ul style="list-style-type: none"><li>• Accommodation and Meal-serving CBOs onboarded</li><li>• HIFIS Integration – adding additional accommodation and meals</li><li>• Culture and Mentoring CBOs onboarded</li><li>• Saskatoon Transit onboarded</li><li>• 911 Services Connected</li><li>• 211 Saskatoon Connected</li><li>• Recreation and Community Services Onboarded</li></ul>
<b>5. ConnectYXE End User Interface Built Delivered to Youth, Families and Allies</b>	<ul style="list-style-type: none"><li>• End User Interface Wire framed and Built</li><li>• Natural Language Interface and AI Interface Delivered</li><li>• Solution delivered by text, voice and smartphone app</li><li>• Solution Tested by End Users (Youth and Families)</li><li>• ConnectYXE Solution Marketed</li><li>• ConnectYXE Deployed to Youth, Families and Allies</li></ul>
<b>6. Reports, Analytics and BI Delivered</b>	<ul style="list-style-type: none"><li>• Reports configured for respective CBOs</li><li>• Consolidated reports, analytics and Business Intelligence ("Insights") Delivered</li></ul>
<b>7. Wi-Fi Access Points and Kiosks Deployed</b>	<ul style="list-style-type: none"><li>• Wi-Fi Access Points (WAPs) deployed in identified neighbourhood.</li><li>• Kiosks configured and deployed in strategic locations</li><li>• Business Case written, and partners engaged to extend Wi-Fi and Kiosks</li></ul>
<b>8. Program Turned Over to Sustainment</b>	<ul style="list-style-type: none"><li>• Program Funding Secured</li><li>• Operations Processes and Tools Adopted</li><li>• Formal Production Turnover to Sustainment Organization</li></ul>
<b>9. Program Closeout</b>	<ul style="list-style-type: none"><li>• Final Accounting and Program Closeout</li></ul>

TABLE 6: PROGRAM SCOPE

We have formulated these scope elements into a Work Breakdown Structure (WBS) shown on the next page. From the WBS we have identified the dependencies and sequence of the projects to produce a detailed schedule, which we have included in Appendix Six: Detailed Gantt.

This scope and schedule encompass the entire ConnectYXE program. Each individual project that comprises the program will similarly develop a project scope and schedule.

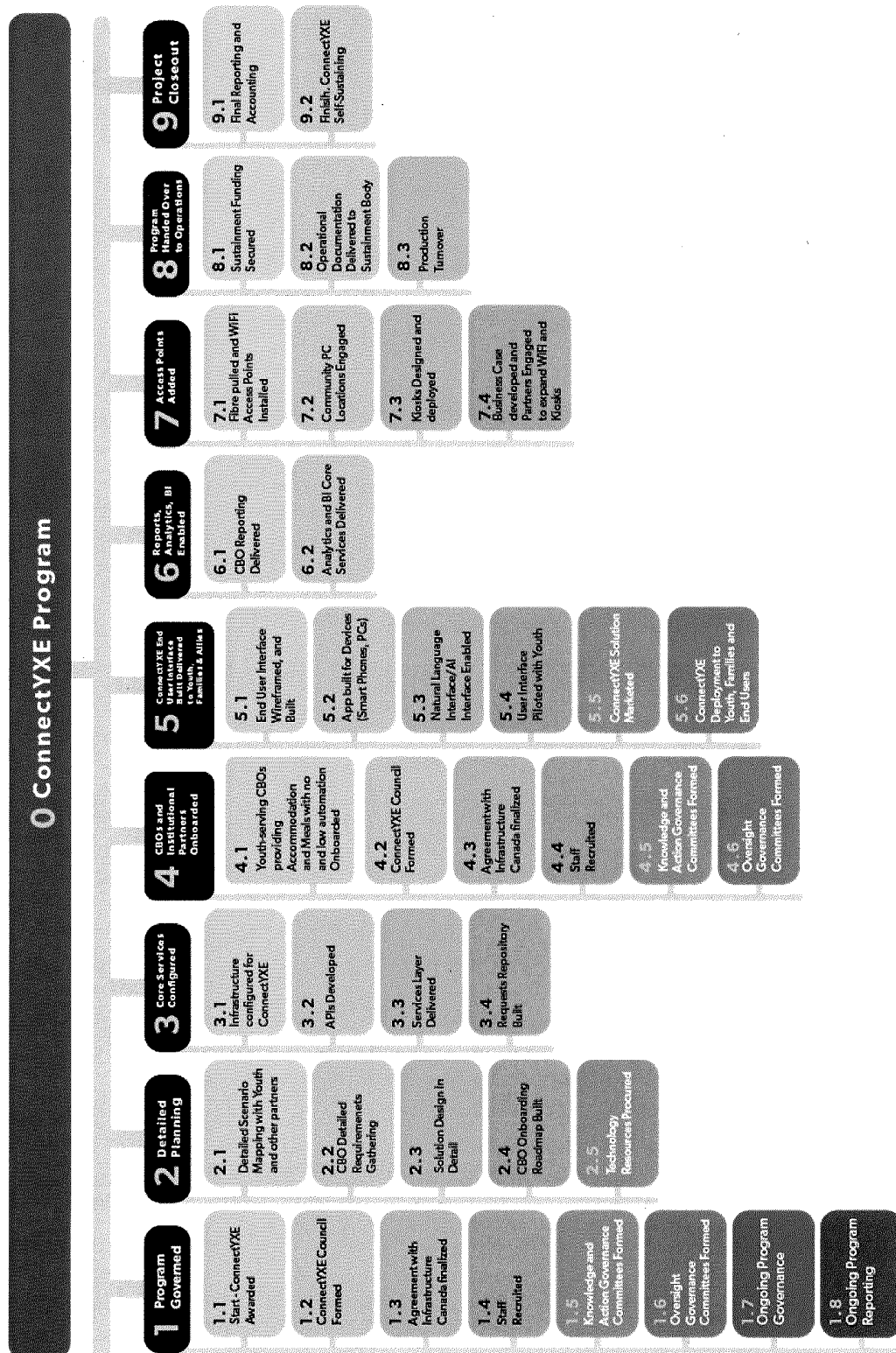


CHART 1: WORK BREAKDOWN STRUCTURE

## 4.3 Project Methodology

ConnectYXE will be managed as a program, comprised of a collection of projects. We will use a “portfolio management” methodology to advise program governance bodies as to the optimal sequence of projects, and will use well established, PMI-based project management methods to manage individual projects. Projects will be run as traditional “waterfall” projects or as agile projects, as best suits the deliverable.

### 4.3.1 Portfolio Management

The City of Saskatoon employs a mature Portfolio Management approach to select which of the many possible projects to undertake. This approach provides a mechanism for managing the ConnectYXE Program: ensuring that projects are undertaken in an order that aligns with the strategic direction of the program; that those projects are resourced appropriately; and then manages which projects must precede other projects. The City portfolio management approach uses Microsoft Project Server (“Project Online”) as an in-kind contribution from the City of Saskatoon.

### 4.3.2 Project Management

The City of Saskatoon has a mature Project Management Office (PMO) and this, too, is available to ConnectYXE as an in-kind contribution to ensure the successful delivery of each of the component projects that make up the ConnectYXE portfolio. These PMO services include:

- Project Charter process;
- Project Scheduling using Microsoft Project Professional;
- Project resourcing and tracking, using Microsoft Project and Project Online;
- Status Reporting;
- A Project Collaboration Site, also a component of Project Online;
- Project Risks Management; and
- A Project Management Community of Practice (PMCoP) which provides support and guidance to project managers.

### 4.3.3 Agile or Waterfall

The City of Saskatoon’s PMO has adopted a hybrid approach to managing each project – selecting a waterfall or an agile approach as best suits the specific project.

The Agile approach is suited to projects where the exact nature of the deliverable is less certain. Agile projects establish a “Product Backlog” and define a series of Sprints – intended to last between two to four weeks, the end of which produces a viable product. The team that produces each sprint is comprised of technical resources – developers, programmers, designers, and of “business” resources – in our case, comprised of youth and representatives of CBOs.

The Waterfall, or traditional, approach is applicable to projects where the process of delivery is well understood and the deliverable well-defined at the out-

set. For such projects, the overhead of daily scrum sessions and other Agile techniques are not warranted.

#### 4.4 Program and Project Resources

A mix of resources will deliver ConnectYXE over the five-year program period. These will be resources from CBOs and institutional partners (including from the City of Saskatoon - Saskatoon Transit and Recreation and Community Development) and procured resources from our technology partners.

At the level of the ConnectYXE Program, we will employ dedicated resources although they may be full-time or part time depending on the requirements of the program at a given time. These are:

- Program Director,
- Technical Director,
- Project Coordinator, and
- Administrator.

We will preferentially seek program staff of Indigenous backgrounds.

Each project initiated by the ConnectYXE program will have its own mix of resources. Typically, a project will use a mix of:

- Project Manager,
- Business Analyst,
- End User Stakeholder Representative (including youth),
- CBO, Institutional Partner Representa-

tative,

- System Architect,
- System Analyst,
- Programmer, and
- Web Designer.

Not all of these resources will be fully dedicated to a specific project. As well, not all resources will remain engaged throughout each respective project. For example, a System Architect would be engaged in the earlier planning stage of a project and have limited or no involvement during implementation.

#### 4.5 Procurement of Resources

Among the in-kind contributions provided by the City of Saskatoon are business support services including Supply Chain Management (SCM). We have partnered with SCM to arrive at a procurement process that incorporates the Community Employment Benefit (CEB) – one that allows for weighting of the results to encourage participation from marginalized communities, and specifically, from Indigenous Communities. It is the goal of ConnectYXE to engage with an Indigenous Technical Director. If that should be unsuccessful, we will engage with an Indigenous Program Coordinator, with the objective of growing this person's skills and experience over the course of the Smart Cities Challenge funding period to the point where this individual can assume the role of Technical Director.

ConnectYXE will procure more than human resources. The ranking system that encourages vendor participation from marginalized and Indigenous communities will apply to any response to a Request for Quotation, or Request for Proposal that is of any size or substance.

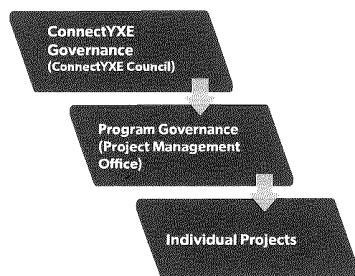


FIGURE 15: PROCUREMENT RANKING PROCESS

We have detailed our approach to procurement in Section 10.7 “Community Economic Benefit Lens of Procurement.”

## 4.6 Program Governance

Program Governance is a part of the ConnectYXE governance, and in turn directs the execution of individual projects. We look at each of these in turn.

### 4.6.1 Responsibilities of the PMO to the ConnectYXE Council

As described above in Section 4.3 “Project Methodology,” the City of Saskatoon’s Project Management Office (PMO) will manage the portfolio – the collection of projects that comprise ConnectYXE, determining the resources required for each, and the dependencies between projects in the portfolio. The PMO will report to the ConnectYXE Council the

program plan, and changes to the plan as the program proceeds. While the PMO will advise the Council of project priorities, the selection of projects remains a responsibility of the Council.

### 4.6.2 Project Oversight and Status Reporting

The PMO is responsible for providing oversight to the respective projects, ensuring that projects are managed according to project management standards. The PMO will receive status reports from the respective projects and will consolidate these and report to the ConnectYXE Council.

## 4.7 Transition to Operations and to the Sustainment Organization

Each project will deliver some function of ConnectYXE. As technical projects deliver working components, these will be operationalized – that is, the project team will formally hand over the component to IT Operations, who will assume responsibility for supporting, maintaining and operating the system as it evolves. This includes:

- Continuing and expanding engagement with CBOs, institutional partners;
- Continuing engagement with youth, developing the functionality of the system to meet their needs;
- Overseeing continued development of the system;
- Sharing the technology with other cities;

- Establishing added services in the IT Service Management (ITSM) application, so that support tickets can be generated and managed;
- Adding new business processes to the ITSM Support Library;
- Providing end user support; and
- Monitoring the service.

A deliverable of the ConnectYXE program is a funded, independent, sustainable organization that will manage the program after the period of Smart Cities funding. The plan calls for this body to form at year three of the program. This organization will assume responsibility for operations.

#### **4.8 Project Monitoring and Control**

Project monitoring and control can refer to the monitoring of the outcomes of projects to ensure that the deliverable achieves the overall objectives of the program. Such outcome monitoring is addressed in Section 5.3 “Monitoring, reporting, and evaluation strategies”. The approach outlined in that section allows ConnectYXE governance to adjust the strategy on an ongoing basis to optimize the effectiveness of the program. The mechanism of performance measurement in Section 5.3 “Monitoring, reporting, and evaluation strategies” ensures this ongoing alignment.

Monitoring and control can also refer to individual projects which must themselves be monitored and adjusted so that

each is successful. To achieve this and following the established processes of the City of Saskatoon Project Management Office, each project will be managed by a project manager, and each will have an accountable project sponsor. Projects will be managed appropriately. The intention is not to add overhead where it does not add value. Accordingly, the Portfolio Management process which oversees the recommendations of which projects proceed also recommends the level of project management (“light”, “standard”, and “complex”). Program Governance selects which projects will proceed, based on the recommendation of the Portfolio Management process.

As each project is authorized and then initiated, that project establishes a baseline project schedule and budget. The PMO requires regular monthly project status reporting. Project status reports forecast revised schedule and costs and if the change from the baseline is significant, a Project Change Request to account for those differences. These reports also provide updates on project risks and issues to the PMO. The PMO aggregates these reports for IT Governance (and on to the ConnectYXE Council), but also provides support and direction to the respective project managers and their teams.

#### **4.9 Stakeholders**

We have discussed engagement with our stakeholder communities in Section 2.4. We addressed the ongoing engagement

with stakeholders and our processes for ensuring actively listening to their requirements and incorporating their concerns into the design of our solution.

**Our stakeholder communities are integrated into our Project Management approach in three ways:**

- As discussed in Section 6.3, our stakeholders are integrated into the oversight of the ConnectYXE program. Presence on Governance Bodies ensures that the mix of projects and their sequence reflects the priorities of the stakeholders.
- Direct participation in project teams, particularly on agile project teams, means that stakeholders perspectives are included daily in the design, development and delivery of each component of the solution.
- Stakeholders are represented in User Acceptance Testing (UAT) of each of the components as they are developed and before they are released.

#### **4.10 Communications**

Communications related to the ConnectYXE program is discussed in Section 2.5, “Communications, Marketing and Change Management.” We address communication of the ConnectYXE program, ensuring that stakeholder communities are continuously informed of the program.

Communication at the individual project level is for the purposes of relating

project status to the PMO (through status reports) and maintaining internal project coordination. Thus, each project maintains a dedicated project site that acts as a repository for that team, to store project team minutes and all artifacts associated, project-specific risks, schedule, and other artifacts. This is a feature of Project Online.

#### **4.11 Approach to Risk Management**

The City of Saskatoon's PMO employs a robust Risk Management approach, and ConnectYXE has adopted this already as we have designed the Program.

Risk Management cuts across each of the sections of this proposal, and risks frequently overlap domains. As a result, we have consolidated the risks, and the discussion of the risk log in Section 9 “Risk Management.” That section shows those risks that, overall, received the highest impact profile: we have provided our current risk log in its entirety in Appendix Four: Entire Risk Log.



# 05 Performance Measurement

## 5.1 Outputs and outcomes

The team has created three major long-term goals to achieve its vision which has been incorporated into the performance metrics. These goals are:

**1. Empowerment** - Increasing the quality of life for Indigenous youth and their community by empowering individuals and giving them easy access to opportunities and resources to enhance opportunities.

**2. Collaboration** - Strengthening partnerships and collaborations, both existing and new, are critical to ensuring this program can be executed and sustained successfully.

**3. Harnessing Technology** - Utilizing innovative data and technology to bridge gaps and leverage opportunities. Building a strong, fluid, multi-faceted system will ensure that information received and analyzed is accurate, in real-time and valuable to the users. It will be easily expandable and transferable, and will ensure that where we find gaps, we will be able to bridge them to provide more services and resources for those in need.

**In our phase-one Smart Cities proposal, the performance metrics included:**

- Reduction in the Indigenous Youth incarceration rate;

- Contribution of data and feedback to a technology hub by service providers;

- Increase in adoption and usage rates of the online platform by Indigenous youth and families;

- Improved usability and accessibility of real-time data through better integration and coordination;

- Improved transportation options and usage, improving youth and families' accessibility to programs and services;

- Increase in life skills and pre-employment training programs/resources; and

- Improved high school graduation rates for Indigenous youth, year over year.

These initial performance metrics have carried forward into this second phase with a strong focus on ensuring data is a two-way process, allowing the end users - the youth, families, allies, CBOs and institutional partners - easy access to the data and resources they need and that delivery of data is accessible and user-friendly. We continue to focus on strengthening coordination between services to ensure youth and their allies are receiving the resources they need at the time they need it.

We have added additional socio-economic benefits to our end results; the five

indicators that summarize the expected socio-economic well-being impact of this program include:

- Decrease the Indigenous youth incarceration rate;
- Increase the high school graduation rate;
- Increase in recreation uptakes;
- Increase in awareness and attendance of cultural activities and events; and
- Decrease in youth crime.

## **5.2 Theory of Change, Logic Model, Performance Metrics and Payment Schedule**

A Theory of Change is a comprehensive illustration of how and why a desired change is expected to happen in a particular context. It is focused on mapping out what has been described as the “missing middle” between what a program or change initiative does (activities and interventions) and how these lead to desired goals being achieved. It does this by first identifying the desired long-term goals and then works back from these to identify all the conditions (outcomes) that must be in place.

Our theory of change builds on the connectivity among our goals of empower-

ing individuals, collaboration between partners, and harnessing innovative technology. We sketch out how the use of our data hub and information access platform (ConnectYXE) will lead towards improved quality of life (particularly purpose, identity, security, and belonging) for Indigenous youth, their families, and allies, and will ultimately reduce Indigenous youth incarceration.

Our theory of change is attempting to identify causal change which is complex, fluid, and in many cases, has not been proven. For example, one path could propose that an increase in awareness of cultural activities leads to an increase in mentorship that leads to an increase in recreation uptake that leads to a decrease in youth crime that leads to a decreased youth incarceration rate that leads to increased high school completion rates. The data we collect and analyze with ConnectYXE will be critical in enabling us to better determine which choices are leading to which paths that lead to our desired effects.

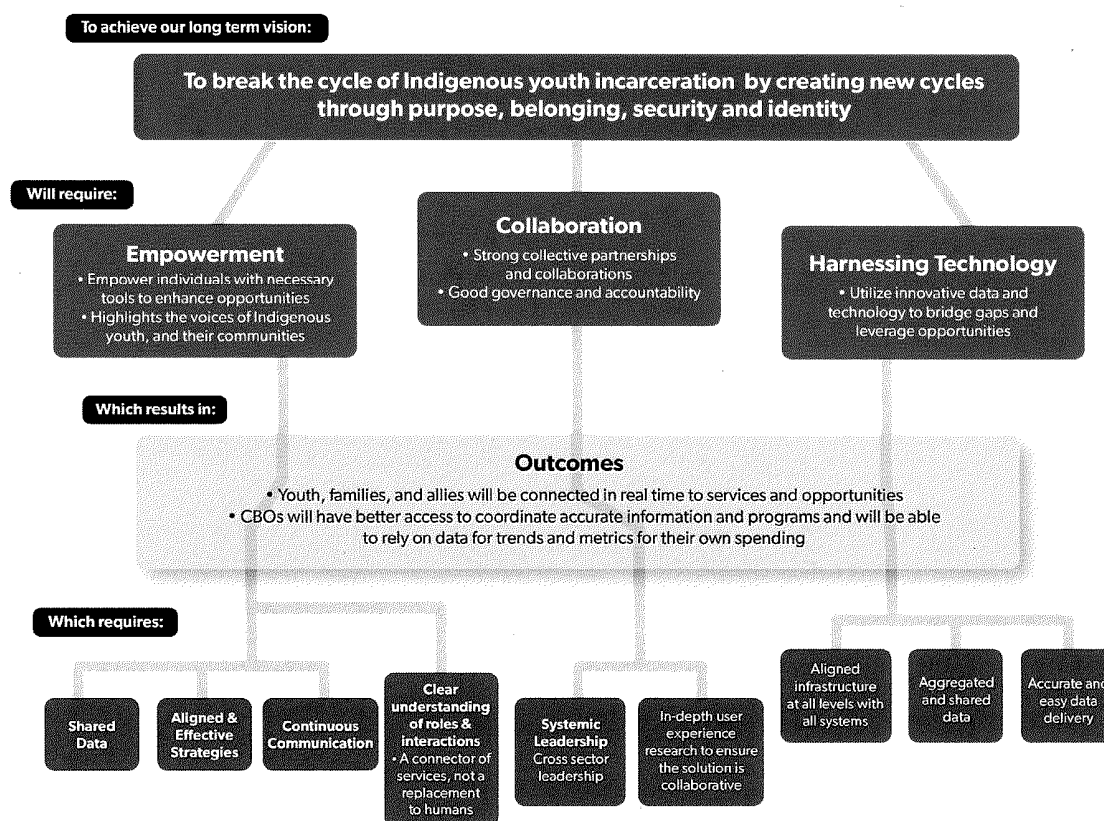


CHART 2: THEORY OF CHANGE

The above Theory of Change describes what desired changes at multiple levels are expected to happen. The logic model below describes how this will be achieved. In the logic model, we define *activities* as what we will do with our resources; *outputs* are a direct product of our activities; and *outcomes* reflect overall behavioural change.

The outcomes for the five-year span of this program are focused around three main areas: maintaining the Indigenous youth voice in the centre of the solution; onboarding CBOs in a collaborative manner; and ensuring proper set up of the ConnectYXE. Outcomes will also be used as performance metrics along with indicators to determine proper monitor-

ing, evaluation and reporting responsibilities.

The outputs for this performance metrics model are based on: ensuring partnerships and collaboration efforts are maintained throughout the project; usability and connectivity of the program are useful to the end users; the system is able to grow and expand with the number of queries and users; and data must continually maintained.

In addition, we have added in indicators and socio-economic impacts to understand what measurements will allow us to know how our program is progressing and to indicate the impact that this system is having for the community.

Inputs (resources)	Activities	Outputs	Outcome	Indicators - Including socio-economic impacts
<p><b>Staffing</b></p> <p><b>Program Team:</b></p> <ul style="list-style-type: none"> <li>• Program Director</li> <li>• Technical Manager</li> <li>• Administrator</li> <li>• Project Coordinator</li> </ul> <p><b>Funding</b></p> <ul style="list-style-type: none"> <li>• Infrastructure Canada</li> <li>• Corporate sponsors</li> <li>• In-kind contributions, institutional partners &amp; CBOs</li> <li>• Social Financing i.e.</li> </ul> <p><b>Industry Standard Facility/Equipment</b></p> <ul style="list-style-type: none"> <li>• Database</li> <li>• Computers</li> <li>• Office space</li> <li>• Cloud storage</li> <li>• Public interactive screens and kiosks</li> </ul> <p><b>Users</b></p> <ul style="list-style-type: none"> <li>• Youth, youth supports, families and allies</li> <li>• CBOs</li> <li>• General public</li> </ul> <p><b>Partnerships/ Collaborations</b></p> <ul style="list-style-type: none"> <li>• Institutional Partners (11 organizations)</li> <li>• Community Allies (37 organizations)</li> <li>• Youth Advisory Group (currently 21 individuals)</li> <li>• Technology Partners (ISM, etc.)</li> </ul>	<p>Provides real-time, live, interactive and verified information and connectivity services</p> <ul style="list-style-type: none"> <li>• Ability to connect 24 hours per day, 7 days per week, 365 days per year</li> <li>• Available at any location</li> <li>• Multi-language</li> <li>• Via telephone, text, chat, email, app, website, public kiosks and interactive screens</li> <li>• Meets industry standards</li> <li>• Connects users who need help and those who offer help</li> <li>• Engagement with youth advisors</li> <li>• Continued support of CBOs</li> <li>• Continuous communication</li> <li>• Solidify partnerships and governance models</li> <li>• Create guidelines for advisory and working groups that emphasize confidentiality</li> <li>• Create &amp; maintain a collective system map to identify overlaps and gaps</li> <li>• Continued involvement of key stakeholders in the building and implementation process</li> </ul> <p><b>System Activities</b></p> <ul style="list-style-type: none"> <li>• Develops and maintains a comprehensive data repository that allows information to be interpreted and exchanged</li> <li>• Databases are updated daily with community, social, government and health service information</li> <li>• Develops and maintains a system to track, report, and analyze community queries and needs</li> <li>• Allows CBOs to aggregate and utilize data for organizational business cases</li> <li>• Designed to be preventative in nature – i.e. providing options and resources for recreational, cultural, mentorship activities</li> <li>• Ability to connect individuals to the right resources in a crisis</li> </ul>	<ul style="list-style-type: none"> <li>• # of queries to the system via public kiosks, website/chatbots, texts, email, calls and app</li> <li>• Usage rates</li> <li>• # of users receiving needed services</li> <li>• # of repeat users</li> <li>• # of locations system is used in</li> <li>• # of users connected to a service</li> <li>• Level of uptake in services</li> <li>• # of data access points</li> <li>• # of contacts made with service providers</li> <li>• # of organizations, programs and services on the database</li> <li>• # of services on boarded into the system</li> <li>• # of community needs reports produced</li> <li>• # of partnerships formed with CBOs</li> <li>• # of trend reports produced</li> <li>• # of CBOs on boarded into the system</li> <li>• Wi-Fi usage</li> </ul>	<p><b>Individual Outcomes</b></p> <ul style="list-style-type: none"> <li>• Users (youth, families, allies) have more options and resources available</li> <li>• Users have increased knowledge of available community resources, activities and events</li> <li>• Users are connected quicker to available resources</li> <li>• Users receive needed services at needed time</li> <li>• Users understand the types of services they can access and where they may face constraints</li> <li>• Users receive better connections to mentors/adult supports</li> <li>• Youth and families experience personal well-being (resilience, meaning purpose, belonging, self-esteem, competence)</li> </ul> <p><b>Community Outcomes</b></p> <ul style="list-style-type: none"> <li>• CBOs are able to understand where there are gaps in programming</li> <li>• CBOs have access to real-time data on needs for community services and where gaps exist and would need to be addressed</li> <li>• CBOs are able to provide services more efficiently and effectively</li> <li>• CBOs are able to focus on their mandate to enhance services rather than be a jack-of-all trades</li> <li>• CBOs now understand what other CBOs are taking on</li> <li>• CBOs, institutions, community members and governments are working collaboratively to address</li> </ul>	<p><b>Individual Indicators</b></p> <ul style="list-style-type: none"> <li>• Increased uptake in recreational and cultural activities</li> <li>• Increased inquiries into community resources, activities and events</li> <li>• Increased uptake in community resources</li> <li>• Increase in efficiency during peak times of services</li> <li>• Increase in mentorship resources</li> <li>• Increased quality of life for in-crisis youth, families and allies</li> </ul> <p><b>Community Indicators</b></p> <ul style="list-style-type: none"> <li>• Increased capacity in programs</li> <li>• Development of accurate trend and data reports</li> <li>• Increased uptake of services</li> <li>• Increased coordination among CBOs and programs</li> <li>• Increase technical capacity from CBO</li> <li>• Decreased Indigenous youth incarceration</li> <li>• Increased high school graduation rate</li> <li>• Decrease in youth crime</li> </ul>

TABLE 7: CONNECTYXE LOGIC MODEL

The following is an illustration of the performance metrics proposed for this program. The performance measurement table combines program deliverables, outcomes as well as a time frame and payment schedule.

	Program Phase	Major Deliverables	Outputs	Timeframe	Payment Schedule Year 1	Payment Schedule Year 2	Payment Schedule Year 3	Payment Schedule Year 4	Payment Schedule Year 5	Total
Immediate	Establish Program Governance	<ul style="list-style-type: none"> <li>ConnectYXE Council established &amp; governance committees recruited and formed</li> <li>ConnectYXE Staff recruited</li> <li>Strategic plan developed</li> <li>Agreements signed</li> </ul>	<ul style="list-style-type: none"> <li>Operational infrastructure for ConnectYXE complete</li> <li>Strategic plan completed</li> </ul>	Year 1 and ongoing afterwards	\$414,012	\$424,062	\$434,414	\$423,476	\$423,476	\$2,130,420
	Stakeholder Engagement and Detailed Planning	<ul style="list-style-type: none"> <li>Scenario mapping and requirements gathering complete</li> <li>Solution design complete</li> <li>CBO Onboarding Roadmap Delivered</li> <li>Technology resources procured</li> </ul>	<ul style="list-style-type: none"> <li>Initial requirements gathering and design complete</li> <li>Front end interface development begins</li> </ul>	Year 1 and ongoing afterwards	\$114,880	\$114,880	\$114,880	\$107,440	\$107,440	\$559,520
	Platform and Core Services Delivered	<ul style="list-style-type: none"> <li>Infrastructure procured and developed</li> <li>Core services established</li> <li>APIs developed</li> <li>Connected to ISM Data Lab and AI Analysis</li> </ul>	<ul style="list-style-type: none"> <li>Platform and core services connected and completed</li> </ul>	Year 1	\$1,118,000					\$1,118,000
Intermediate	CBO and Institutional Partners Onboarded	<ul style="list-style-type: none"> <li>Priority services on-boarded and integrated - i.e. HIFIS (housing), transit, recreation, etc.</li> <li>Marketing &amp; communications plan delivered</li> <li>Deployment begins</li> </ul>	<ul style="list-style-type: none"> <li>Initial CBO services onboarded and integrated</li> <li>Marketing &amp; communications plan executed</li> </ul>	Year 1-2 and ongoing afterwards	\$101,400	\$43,400	\$43,400	\$43,400	\$43,400	\$275,000
	ConnectYXE End User Interface Built Delivered to Youth, families and Allies	<ul style="list-style-type: none"> <li>End Use Interface wire-framed, tested and built</li> <li>Natural Language Interface and AI Interface Delivered</li> <li>ConnectYXE deployed to youth, families and allies</li> </ul>	<ul style="list-style-type: none"> <li>ConnectYXE goes live and is deployed to all end users</li> </ul>	Year 2-3		\$1,752,000	\$1,554,000			\$3,306,000
	Reports, Analytics and BI Delivered	<ul style="list-style-type: none"> <li>Reports configured for respective CBOs and deliver consolidation reports, analytics, business intelligence</li> </ul>	<ul style="list-style-type: none"> <li>CBOs are utilizing analytics and business intelligence from ConnectYXE</li> </ul>	Year 2-3 and ongoing afterwards		\$10,000	\$10,000	\$10,000	\$10,000	\$40,000
Long Term	Wi-Fi Access Points and Kiosks Deployed	<ul style="list-style-type: none"> <li>Deploy Wi-Fi Access Points (WAPs) in identified neighbourhood</li> <li>Kiosks configured and deployed in strategic locations</li> </ul>	<ul style="list-style-type: none"> <li>Wi-Fi enabled in all identified neighbourhoods and kiosks utilized throughout the city</li> </ul>	Year 4				\$495,000		\$495,000
	Program Access Points and Kiosks Deployed	<ul style="list-style-type: none"> <li>Sustainment funding secured</li> <li>Operational documentation delivered to sustainment body</li> <li>Data monitoring &amp; input capabilities</li> </ul>	<ul style="list-style-type: none"> <li>ConnectYXE is fully enabled and used by all end users</li> <li>Sustainment plan is established and executed</li> </ul>	Year 4-5				\$686,000	\$490,000	\$1,176,000
Contingency per Budget				Years 1 through 5	\$172,852	\$232,452	\$213,652	\$174,552	\$106,552	\$900,060

### 5.3 Monitoring, reporting, and evaluation strategies

The reporting and evaluation process for ConnectYXE will have a scheduled check-in every 90 days to ensure data is accurate and timely, that services are continuing to be connected to the system, and that users are able to access the necessary data, reports and information that they require. Reports and evaluation will be completed by the ConnectYXE support team and submitted to ConnectYXE Council for approval of action items.

A results-based monitoring framework determines if the program is progressing according to a plan and gives an explicit definition of results through to measurable indicators. It provides a clear relationship between inputs, outputs, intermediate results or outcomes, and impact. By quantifying these variables to the extent possible, the framework monitors progress towards the results. We will use the outcomes and socio-economic indicators from the Logic Model to determine how to evaluate the socio-economic impacts of the program. The challenge will be to articulate the causal change and we anticipate it being a fluid process where the combination and sequence of programs (i.e. cultural awareness, mentorship, recreation, etc.) may vary as it leads to a decrease in crime which leads to a decrease in incarceration. The goal of ConnectYXE is to identify what choices are taken and what order of choices

may have the greatest impact on Indigenous youth incarceration.

**Our proposed monitoring system will be the following:**

1. A defined model that explains the outcomes without the intervention of the proposed initiative. This can be established through various econometric methods. While developing the model, we will identify variables that could affect the outcome of a certain indicator (control variables).
2. Collect periodic data on the outcomes and the control variables.
3. Estimate the model before the implementation of the program.
4. Using the estimated model, predict the outcome indicator before the implementation of the program (baseline).
5. To estimate the net impact of the program, two options will be used to determine the impact:
  - a. Option 1: Using the new data collected during the implementation of the program, we will predict the level of the outcome indicator, deduct the actual level of the indicator from the predicted level to arrive at the net impact of the program.
  - b. Option 2: Re-estimate the model using additional data collected during program implementation.

The following table illustrates our suggested results-based monitoring framework:

Outcome Indicator	Output Indicators	Explained Input	Likely Control Variables
<b>Definition</b>			
Results that we aim to achieve and measure	Measurable/quantifiable indicators that can be used as proxies for outcome indicator	Input that represents implementation programs. Our analysis will be a time series that goes from the times that the social programs did not have the benefit of ConnectYXE to a period where they did and how our program changed things.	Other inputs affecting the outcome. We measure their effect to delineate the effect of our implementation.

TABLE 8: RESULTS-BASED MONITORING FRAMEWORK

## 5.4 Identification of risks and development of appropriate mitigation strategies

Risks in this area are dependent on ensuring there is progress made towards the proposed outcomes. Risk Management cuts across each of the sections of this proposal, and risks frequently overlap domains. As a result, we have consolidated the risks, and the discussion of the risk log in Section 9 “Risk Management.” That section shows those risks that, overall, received the highest impact profile: we have provided our current risk log in its entirety in Appendix Four: Entire Risk Log.

# 06 Governance

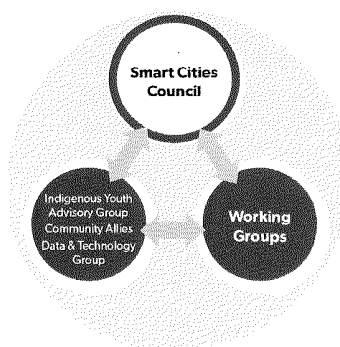
## 6.1 Description of the Governance Framework

ConnectYXE is inclusive and complex. It requires an inclusive and complex governance model. In *A Theory of Governance* (2013), Mike Behir defined how “Governance refers to all processes of governing, whether undertaken by a government, market, or network; whether over a family, tribe, corporation, or territory; and whether by laws, norms, power, or language.”<sup>14</sup> Behir also refers to how the activity of governing is increasingly shared with social actors, including private firms, non-governmental organizations, and non-profit service providers.

ConnectYXE needs to incorporate all these parties and more: a municipal government, a First Nations government, a Metis government, private technology firms, NGOS and service providers working in the areas of safety, mental health, crisis intervention, youth support, as well as institutions (health, educational, and policing).

The governance of this program has been developed through engagement with the institutional partners and community allies, determining who has “voice” and who will have “votes,” and ensuring these roles are fair and accountable to the other parties, and that the fullest

### Knowledge and Action Circle



### Oversight Circle

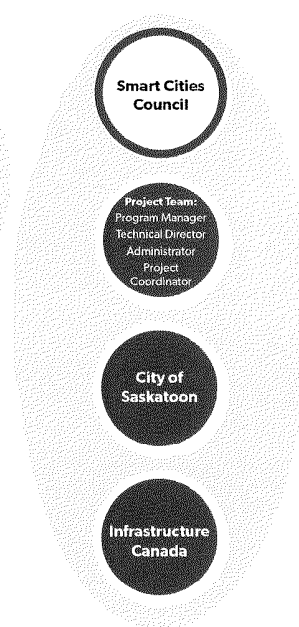


FIGURE 16: CONNECTYXE GOVERNANCE MODEL

engagement is made possible for all parties.

The goal of this governance model is to separate the functions of governance into two circles to demonstrate the relationships between the parties within a particular circle, as well as establish to whom they are accountable. The engagement and knowledge-sharing among the groups in the Knowledge and Action Circle (shown in the figure) is critical to the success of ConnectYXE. It is the heart of the program and, for the purposes of simplicity and reducing bureaucracy,

14 Mark Behir, *A Theory of Governance*, London England, University of California Press, 2013



it was felt this circle needed to be kept whole and separate from more hierarchical relationships in the Oversight Circle.

It was also important in the development of the governance model to ensure that the groups in the Knowledge and Action Circle are as close to the data as possible. They represent the larger community, and for trust and relationships in the ConnectYXE program to be built and maintained, these groups need to be key partners in recommending and influencing how the data and information will be used.

The ConnectYXE Council is the decision-making body for both circles, providing the governance consistency and continuity between the two circles.

## 6.2 Principles

Our principles relate back to the seven guiding principles outlined in Section 2.4.1. The principles are grounded in this governance model and extend throughout all aspects of the program.

## 6.3 The Knowledge and Action Circle

The objective for this circle is to enable full engagement and knowledge-sharing for all of our partners – ranging from institutional, community, youth and technology partners. For example, the data being collected needs to be interpreted accurately, the youth need to provide their perspectives on what is working and not working, and the ConnectYXE

Council, as the decision-makers, needs to have as fulsome information as possible to make appropriate decisions.

This circle is where the information and programming will be learned, shared, and acted upon, with each grouping having distinct responsibilities. These are the subject matter experts. Their role is to provide the data to ConnectYXE, analyze the data when it is produced into reports, and understand how it reflects the needs and context of the community. The knowledge produced by these groups becomes concrete actions when the ConnectYXE Council makes decisions about programming and policy.

The groups in this circle are supported by the program team, which we have put in the Oversight Circle. In some cases, this support will be to provide technical or human support to the CBOs to be integrated into ConnectYXE technology. In other cases it will be to provide grants to those CBOs to build capacity within their organization around data and analytics. The program team will also ensure communication of information among the groups, opportunities to engage and learn from each other, and regular updates on the progress of ConnectYXE.

Members of the ConnectYXE Council and groups will not receive honorariums or payment for their participation. Rather, the organization they are associated with will receive funding to support initiatives that further ConnectYXE outcomes. Youth will receive honorariums

for their participation.

**The composition of the Knowledge and Action Circle is made up of:**

ConnectYXE Council: 6 representatives from the institutional partners and 5 representatives from Indigenous partners, community allies, Indigenous youth, and technology partners, for a total of 11 people on the Council.

The key responsibilities of the ConnectYXE Council are to provide strategic direction and oversight. It is also responsible for making the final decisions on strategic direction and work plans, aligning priorities, and financial oversight. It is accountable to the community, Infrastructure Canada and the City of Saskatoon. The current institutional partners are:

- Central Urban Metis Federation Inc.
- Greater Saskatoon Catholic Schools
- Saskatchewan Health Authority
- Saskatchewan Indian Institute of Technologies
- Saskatchewan Polytechnic
- Saskatoon Police Service
- Saskatoon Public School Division
- Saskatoon Tribal Council
- United Way of Saskatoon and area
- University of Saskatchewan

Indigenous Youth Advisory Group: comprised of Indigenous youth aged 15 – 29 who are currently part of the Smart Cities Challenge proposal. The youth are members of programs run by community allies and institutional partners. Their individual participation in the group

may change overtime, to be replaced by another member from that program. The program team will be responsible for coordinating engagement and support for the Youth Advisory Group. This group will provide direction and advice to the ConnectYXE Council on community priorities and needs. Youth Advisory Group are accountable to the ConnectYXE Council.

Community Allies, Mentors, Elders: comprised of representatives from community and/or institutional partners that are working directly with Indigenous youth. They provide advice and guidance to the ConnectYXE Council on community priorities and needs and support the youth advisory group. They are accountable to the ConnectYXE Council.

Data and Technology Group: comprised of representatives from technology partners who are both private technology companies, technical staff working with the institutional partners and CBOs, and non-technical members representing the requirements of respective organizations and end users. This group is accountable to the ConnectYXE Council.

Working Groups: comprised of representatives of CBOs working in the areas that fall within each pillar: belonging, purpose, identity, security. Their responsibilities include ensuring relevant data is collected from their organizations for the Data Centre, to regularly reviewing and discussing the data analytics, discussing how the data informs programs, services and policy, providing proposals for new

programs and services to be onboarded into ConnectYXE, and offering insight to the ConnectYXE Council, directly and through the Project Team. They are accountable to the ConnectYXE Council.

## 6.4 The Oversight Circle

The Oversight Circle provides accountability and management functions are located.

**Responsibilities of this oversight circle will include:**

- Determining and ensuring mission and purpose;
- Selecting and supporting the chief executive;
- Ensure effective planning as well as monitoring and strengthening programs and services;
- Ensuring there are adequate financial resources;
- Protecting assets and providing proper financial and data oversight;
- Ensuring legal and ethical integrity; and
- Enhancing the organizations public standing.<sup>15</sup>

Once the ConnectYXE Council and program team is in place, a working group made up of representatives from both tables will be initiated to develop:

- Policies and procedures;
- A strategic plan;
- A communications plan; and
- An evaluation plan.

The governance of this program will also be developed with the intention that after the five-year grant period, it will transition to a separate and sustainable non-profit organization.

**The Oversight Circle is made up of:**

- ConnectYXE Council – see above for description
- Program Team: A program manager, technical director, administrator, and project coordinator. This team is responsible for overall project administration and management, communications and engagement and is accountable to the ConnectYXE Council and City of Saskatoon.
- City of Saskatoon: The City is the project sponsor and the point of contact for the Federal Government. Key responsibilities include being the contract agreement holder, project reporting, and financial management. It is accountable to Infrastructure Canada and the ConnectYXE Council.
- Infrastructure Canada – Will remain involved in the program as part of the federal program.

<sup>15</sup> Source: Board responsibilities and Structure. (2016, June 2). Retrieved from: [www.boardsource.org/resources/board-responsibilities-structure](http://www.boardsource.org/resources/board-responsibilities-structure)

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## 6.5 Data governance

Data Governance of ConnectYXE is detailed in Section 7.6 “Data Governance.” The Data Governance Committee will be delivered by a group of representatives from CBOs, institutional partners, the City, and the technical solution provider, ISM. This committee will be responsible for overseeing:

- Audit, Compliance and Risk Policies;
- Ongoing Regulatory compliance;
- Data quality improvement;
- Customer experience / application usage and performance;
- Big data/Open Data (include usage, reporting of value to the public);
- Data retention and destruction processes, procedures and approvals;
- Processes and procedures for approved, aggregating and sharing data;
- Direct Freedom of Information Requests; and
- Establishing and monitoring performance metrics

## 6.6 Letters of Support

Letters of support from Institutional partners have been collected and are included in Appendix Five: Letters of Support.

## 6.7 Risks

Risk management cuts across each of the sections of this proposal, and risks frequently overlap domains. As a result, we have consolidated the risks, and the discussion of the risk log in Section 9 “Risk Management.” That section shows those risks that, overall, received the highest impact profile. We have provided our current risk log in its entirety in Appendix Four: Entire Risk Log.

# 07 Data and Privacy

We recognize that the success of ConnectYXE hinges on trust of the system by youth, their families and allies. Maintaining that trust demands that ConnectYXE comply with all applicable legislation, regulations, standards and best practices in collecting and managing data from or about individuals.

All dimensions of Data Governance and Management are built to start creating a system respecting the privacy of the data and complying with privacy regulations.

This section will 1) address what data will flow into and out of the Connect YXE system; 2) discuss requirements to connect to the system from the view of respective parties; and 3) describe how the program will protect privacy and manage data.

## 7.1 Data Life Cycle

Privacy and data governance must be designed in the context of the solution. The following diagram is a detailed view of the data flow of ConnectYXE. It details the “Core” shown more abstractly as a circle in Section 3.1.1 “Core Services”.

1. A business analyst will work with each participating stakeholder group to identify the data required from their organization for the public application. To add value to the stakeholders, data required to enhance their business under-

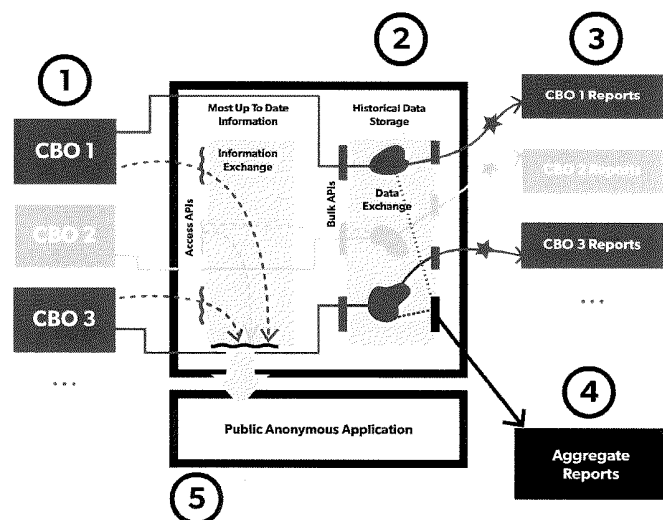


FIGURE 17: DATA FLOW FOR CONNECTYXE

standing and reporting ability will also be identified at this time.

2. All required data will be connected to ConnectYXE and transformed by the API. This process will exclude PI/PHI. It will be segregated from all other stakeholder data. This data is encrypted in transit and secured through access controls at rest and will continue to be owned by the provider. Historical data will be stored here.

3. Participating stakeholders can request to have reports built to enhance understanding of their own operations. Reports will include only data from that specific stakeholder and will remain segregated from the other participants.

4. To understand system wide trends (e.g. “How many beds are available each day across all participating shelters?”),

non-identifiable information will be combined from multiple service providers. No PI/PHI will be provided in an aggregate report. Each participating stakeholder group will provide consent to have their data used for these reports. These aggregate reports will be governed by the Data Governance Committee; appropriate access to the stakeholder groups will be determined on a case-by-case basis.

5. To direct youth to services with capacity to serve them, the public application provides relevant information from any service provider.

6. New data, all non-PI/PHI will be created through use of the public application. This data will be stored in a separate repository from all other stakeholder groups and will be governed by the Data Governance Committee.

## 7.2 User Access

Different users require different levels of access. There are three broad categories of users who will require access to the system:

1. CBOs and other stakeholder groups will have authenticated access to a business portal, allowing them to query their own data, view reports built using their information, and view aggregate, anonymous reports to which they have been granted access by the Data Governance Committee.
2. Youth, family, allies, and other members of the public will have access to joint aggregate data through the Public

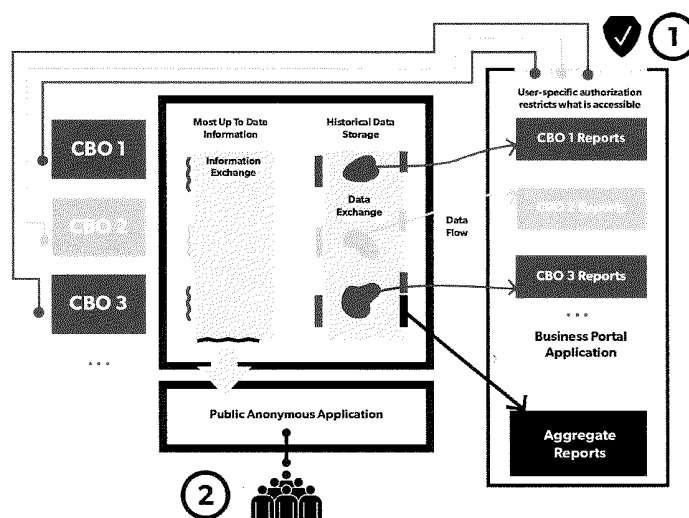


FIGURE 18: USER ACCESS

Anonymous Application. This access will not require any sign-in information to protect the identity of the user.

3. System Administrators. Administrator access has elevated privilege, using principles of *least access*, Segregation of Duties (SoD), and is audited. Based on the design of ConnectYXE – which will not contain PI/PHI – Data Governance (a function of IT Operations) will ensure appropriate and monitored access to ConnectYXE by those with System Admin privileges.

## 7.3 Technical Provider Access

The ConnectYXE system will connect to the Historical Data Storage using the ISM Data Lab, to extract the data that will be subsequently used to provide the ConnectYXE services.

1. ConnectYXE will connect to service provider source systems to populate the historical data storage repositories, including transformed data from each

service provider. This access will be enabled through agreements between ConnectYXE, the City of Saskatoon and the specific service providers.

2. These agreements may also include, or be amended to include, report creation permissions and requirements. To do this, ConnectYXE will access the Historical Data Storage Repositories to connect required data to the ISM Data Lab. Creating aggregate reports will be managed through data sharing agreements.

3. Data permitted to be moved into the lab will be used to create individual reports for service providers, as well as aggregate reports as directed and approved by the Data Governance Committee.

## 7.4 Collection and Use of Data

The objective of ConnectYXE is to on-board service-providing CBOs and institutional partners, and to connect youth to these services. Trust is the biggest barrier to adoption. ConnectYXE will not collect nor store PI or PHI and will not request youth to identify themselves to access this system.

## 7.5 Legislative Compliance

ConnectYXE will comply with all legislative requirements, Federal, Provincial and municipal. We have completed Preliminary Privacy Impact Assessments (PIIA). The PPIA is attached as Section 11.1 “Appendix One: Preliminary Privacy Impact Assessment for the City of Saskatoon” along with the respective approvals.

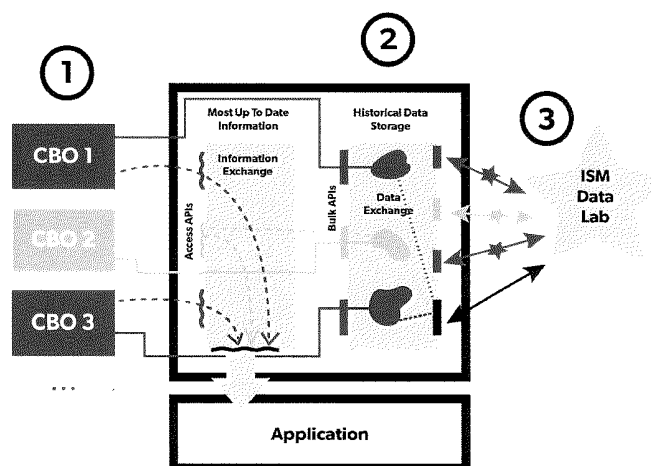


FIGURE 19: TECHNICAL PROVIDER ACCESS

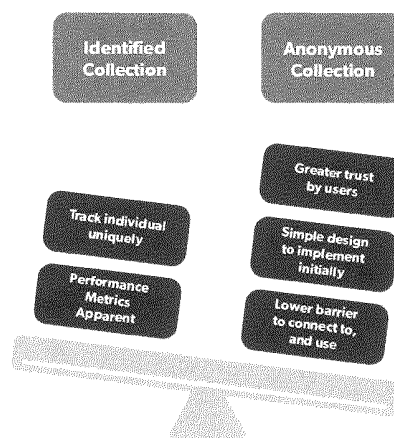


FIGURE 20: IDENTIFIED VERSUS ANONYMOUS COLLECTION OF DATA

## 7.5.1 Fair Privacy Principles

The ten fair privacy principles are respected in the ConnectYXE design:

Principle	Details of how the principle is met
<b>Accountability</b> An organization is responsible for personal information under its control. It must appoint someone to be accountable for its compliance with these fair information principles	The designated individual accountable for compliance is the City of Saskatoon's Access and Privacy Officer.
<b>Identifying Purposes</b> The purposes for which the personal information is being collected must be identified by the organization before or at the time of collection	The information collected for Connect YXE will not be identifiable PI/PHI. CBOs and institutional partners will be informing their clients of their partnership in ConnectYXE and communicate no identifiable information will be involved in the partnership with ConnectYXE.
<b>Consent</b> The knowledge and consent of the individual are required for the collection, use, or disclosure of personal information, except where inappropriate	ConnectYXE will not collect or aggregate PI/PHI and so does not require consent
<b>Limiting Collection</b> The collection of personal information must be limited to that which is needed for the purposes identified by the organization. Information must be collected by fair and lawful means	As this solution seeks to connect at-risk individuals to services and to track usage and performance metrics rather than serve as a case management tool, identifiable PI/PHI is not required
<b>Limiting Use, Disclosure and Retention</b> Unless the individual consents otherwise or it is required by law, personal information can only be used or disclosed for the purposes for which it was collected. Personal information must only be kept as long as required to serve those purposes	Connect YXE will not collect personally identifiable information at this time
<b>Accuracy</b> Personal information must be as accurate, complete, and up-to-date as possible to properly satisfy the purposes for which it is to be used	Connect YXE will not be collecting identifiable PI/PHI therefore this fair privacy principle does not apply
<b>Safeguards</b> Personal information must be protected by appropriate security relative to the sensitivity of the information	ConnectYXE adheres to strict IT technical securities, including regular internal and external audits. Standard administrative policies and processes will be created even though all data will not involve identifiable PI/PHI
<b>Openness</b> An organization must make detailed information about its policies and practices relating to the management of personal information publicly and readily available	Connect YXE governance will ensure the activity of the project is open providing details regarding any policies and procedures
<b>Individual Access</b> Upon request, an individual must be informed of the existence, use, and disclosure of their personal information and be given access to that information. An individual shall be able to challenge the accuracy and completeness of the information and have it amended as appropriate	Data is not personally identifiable.
<b>Challenging Compliance</b> An individual shall be able to challenge an organization's compliance with the above principles. Their challenge should be addressed to the person accountable for the organization's compliance with Personal Information and Protection of Electronic Documents (PIPEDA), usually their Chief Privacy Officer	Issues or concerns regarding Connect YXE compliance with privacy legislation will be answered by ConnectYXE Data Governance Committee.



### 7.5.2 The Local Authority Freedom of Information and Protection of Privacy Act (LAFOIP)

As detailed through compliance with the fair privacy principles, ConnectYXE addresses the two major goals of LAFOIP: to ensure individuals have access to public documents and the protection of privacy. CBOs and institutional partners will not be disclosing identifiable PI/PHI. Only non-personal and public information will be shared and aggregated. Therefore the Act's requirement to collect, use and disclose the least amount of information necessary to satisfy the program is achieved. Given the funding source, ConnectYXE will be subject to freedom of information requests; should an access request occur it will be managed through the City of Saskatoon's City Clerk's Office.

### 7.5.3 City of Saskatoon Municipal Legislative Requirements.

Records created by ConnectYXE will follow the City's retention schedule and will be preserved as a public document as required by The Cities Act.<sup>16</sup> The preservation of public documents indicates the City must establish and abide by record retention and disposal schedules.

## 7.6 Data Governance

Data Governance fits within IT Operations, which in turn is a part of the ConnectYXE program governance. Data Governance fits within a set of gover-

nance principles. This section addresses those principles, and what governance of ConnectYXE entails. Last, this section will provide details as to the Data Governance committee that will provide oversight.

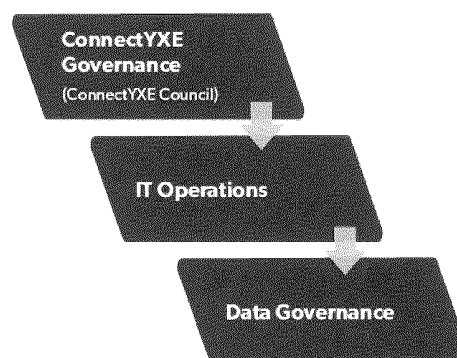


FIGURE 21: DATA GOVERNANCE

### 7.6.1 Data Protection and Security

ConnectYXE is based on the mature design of the Saskatchewan Social Innovation Hub (SIH). This system was designed by and is operated by ISM Canada. ConnectYXE will leverage the security and privacy elements of that design. The SIH was designed to meet the privacy and security standards of the Government of Saskatchewan and has been audited and approved by the IT Division (ITD) of the Government of Saskatchewan. By partnering with ISM, the City will leverage a well-established set of security and privacy protocols for the technical solution.

ISM's Framework of Internal Control (FIC) is based on the Committee of

16 <http://www.qp.gov.sk.ca/documents/english/Statutes/Statutes/c11-1.pdf>

Sponsoring Organizations of the Treadway Commission (COSO) Internal Control - Integrated Framework 2013. Controls compliance is managed through ISM's Management's Self-Assessment of Controls (MSAC) program. MSAC is an extensive control point testing and monitoring process across all aspects of the organization including customer relationship management and IT delivery services.

### **7.6.2 Monitoring for Data and Privacy Breaches**

**IT Operations will monitor for data and privacy breaches. This includes these steps:**

1. We will routinely examine data submitted from CBOs and institutional partners looking for personal data that may have inadvertently been transmitted to ConnectYXE.
2. IT Operations will engage with third parties to conduct penetration assessments and vulnerability assessment of ConnectYXE.

If an exposure is identified, we will take recommended steps to address the exposure, and to determine if the exposure led to a breach.

If a data or privacy breach occurs, IT Operations will follow the City of Saskatoon Privacy Breach Protocol.

### **7.6.3 Open Data**

ConnectYXE is designed to be accessible to the public at large. The solution, by

design is "Open Data," and moreover, fits within the City's Open Data Strategy. Published ConnectYXE data will be added to the City's Open Data Catalog. There will be a process created for approval before publishing data collected from ConnectYXE. An example of data that would belong in the catalog is transit and transportation information, based on the requests. This type of data can help ride share organizations market their services to those locations.

### **7.6.4 Data Governance Committee**

The Data Governance Committee will focus on delivering a technically accurate, secure and private solution, to build trust with the public as well as the CBOs and institutional partners. The City is the data steward in this solution. ISM Canada will be the data custodian.

The Data Governance Committee will be comprised of representative stakeholders from the City, and ISM Canada. The list of the responsibilities of this committee is in Section 6.5.

## **7.7 Risk Management**

Risk Management cuts across each of the sections of this proposal, and risks frequently overlapped domains. As a result, we have consolidated the risks, and the discussion of the risk log in Section 9 "Risk Management." That section shows those risks that, overall, received the highest impact profile: we have provided our current risk log in its entirety in Appendix Four: Entire Risk Log.

# 08 Financial

## 8.1 Comprehensive project budget

The comprehensive project budget for the next phase of this project is below. A detailed breakdown of the budget can be seen in the notes below.

Technology	Year 1	Year 2	Year 3	Year 4	Year 5	Total
ConnectYXE Core Systems (Back-End) User Interface (Front-End)	\$618,000	\$1,727,000	\$1,529,000	\$661,000	\$465,000	\$5,000,000
Coding and Development	\$500,000	-	-	-	-	\$500,000
Maintenance and upgrades	-	\$25,000	\$25,000	\$25,000	\$25,000	\$100,000
Wi-Fi/kiosks for pilot - Network Equipment	-	-	-	\$387,000	-	\$387,000
Wi-Fi/kiosks for pilot - Network Construction	-	-	-	\$108,000	-	\$108,000
	\$1,118,000	\$1,752,000	\$1,554,000	\$1,181,000	\$490,000	\$6,095,000
Governance/Staff/Management	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Project team compensation	\$350,812	\$360,862	\$371,214	\$381,876	\$392,856	\$1,857,620
Contract support	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000	\$100,000
Elder honorariums	\$43,200	\$43,200	\$43,200	\$21,600	\$21,600	\$172,800
Youth engagement	\$14,880	\$14,880	\$14,880	\$7,440	\$7,440	\$59,520
Community partner engagement	\$100,000	\$100,000	\$100,000	\$100,000	\$100,000	\$500,000
	\$528,892	\$538,942	\$549,294	\$530,916	\$541,896	\$2,689,940
Other Program Costs	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Measure & Monitor Performance	\$60,000	\$10,000	\$10,000	\$10,000	\$10,000	\$100,000
Communications and promotion	\$10,000	\$20,000	\$20,000	\$20,000	\$20,000	\$90,000
Office costs, equipment, supplies	\$31,400	\$23,400	\$23,400	\$23,400	\$23,400	\$125,000
	\$101,400	\$53,400	\$53,400	\$53,400	\$53,400	\$315,000
Contingency	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Technology	\$111,800	\$175,200	\$155,400	\$118,100	\$49,000	\$609,500
Governance, staff and management	\$52,900	\$53,900	\$54,900	\$53,100	\$54,200	\$269,000
Other program costs	\$8,152	\$3,352	\$3,352	\$3,352	\$3,352	\$21,560
	\$172,852	\$232,452	\$213,652	\$174,552	\$106,552	\$900,060
<b>Total</b>	<b>\$1,921,144</b>	<b>\$2,576,794</b>	<b>\$2,370,346</b>	<b>\$1,939,868</b>	<b>\$1,191,848</b>	<b>\$10,000,000</b>

### Note 1: Breakdown of project team compensation

<b>Estimated annual salary increases - 3%</b>					
<b>Salaries</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>
Program Manager	\$100,000	\$103,000	\$106,090	\$109,273	\$112,551
IT Technical Director	\$100,000	\$103,000	\$106,090	\$109,273	\$112,551
Administrator	\$60,000	\$61,800	\$63,654	\$65,564	\$67,531
Project Coordinator	\$75,000	\$77,250	\$79,568	\$81,955	\$84,413
	\$335,000	\$345,050	\$355,402	\$366,064	\$377,045
<b>CPP &amp; EI</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>
Maximum employer portion of annual CPP	\$2,749	\$2,749	\$2,749	\$2,749	\$2,749
Maximum employer portion of annual EI	\$1,204	\$1,204	\$1,204	\$1,204	\$1,204
	\$3,953	\$3,953	\$3,953	\$3,953	\$3,953
Multiplied by: # of employees	4	4	4	4	4
	\$15,812	\$15,812	\$15,812	\$15,812	\$15,812
	<b>\$350,812</b>	<b>\$360,862</b>	<b>\$371,214</b>	<b>\$381,876</b>	<b>\$392,857</b>

### Note 2: Calculation of Elder Honorariums

Number of Elders	24	24	24	24	24
Multiplied by: Number of meetings	12	12	12	6	6
Multiplied by: Meeting honorarium	\$150	\$150	\$150	\$150	\$150
	<b>\$43,200</b>	<b>\$43,200</b>	<b>\$43,200</b>	<b>\$21,600</b>	<b>\$21,600</b>

### Note 3: Calculation of Youth Engagement

<b>Honorariums</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>
Number of youth per focus meeting	20	20	20	20	20
Multiplied by: Number of meetings	12	12	12	6	6
Multiplied by: Honorarium per youth per meeting	\$50	\$50	\$50	\$50	\$50
	<b>\$12,000</b>	<b>\$12,000</b>	<b>\$12,000</b>	<b>\$6,000</b>	<b>\$6,000</b>
<b>Meals</b>	<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>	<b>Year 5</b>
Number of youth per focus meeting	20	20	20	20	20
Multiplied by: Number of meetings	12	12	12	6	6
Multiplied by: Meal cost per youth	\$12	\$12	\$12	\$12	\$12
	2,880	2,880	2,880	\$1,440	\$1,440
	<b>\$14,880</b>	<b>\$14,880</b>	<b>\$14,880</b>	<b>\$7,440</b>	<b>\$7,440</b>

#### Note 4: Community Partner Engagement

	Year 1	Year 2	Year 3	Year 4	Year 5
Community partner stipends (37*\$2,000 per year)	\$74,000	\$74,000	\$74,000	\$74,000	\$74,000
Room rentals and other amenities	\$6,000	\$6,000	\$6,000	\$6,000	\$6,000
Other costs of community partner engagement	\$20,000	\$20,000	\$20,000	\$20,000	\$20,000
	<b>\$100,000</b>	<b>\$100,000</b>	<b>\$100,000</b>	<b>\$100,000</b>	<b>\$100,000</b>

#### Note 5: Office costs, equipment and supplies

	Year 1	Year 2	Year 3	Year 4	Year 5
Office Equipment (\$2,000 per employee in year 1)	\$8,000	\$-	\$-	\$-	\$-
Office supplies (\$200 per employee)	\$800	\$800	\$800	\$800	\$800
Rent/occupancy costs	\$21,600	\$21,600	\$21,600	\$21,600	\$21,600
Memberships/event registration fees	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000
	<b>\$31,400</b>	<b>\$23,400</b>	<b>\$23,400</b>	<b>\$23,400</b>	<b>\$23,400</b>

#### 8.1.1 Implementation In-Kind Contributions

The following chart depicts the in-kind services we expect to receive in the five-year program plan:

In-kind contributions for Next 5 years	Year 1	Year 2	Year 3-5
<b>City Staff Time</b>			
Social Development Manager	\$7,200	\$5,400	\$4,800
Social Development Consultant	\$4,950	\$3,600	\$3,600
Community Development Manager	\$2,880	\$1,728	\$1,440
IT-Project management support & IT operations	\$9,000	\$9,000	\$9,000
Mayor's Office	\$3,600	\$2,880	\$2,160
Community Services Director	\$4,500	\$3,600	\$2,700
Marketing - general supports PSA, social media	\$2,000	\$1,200	\$1,200
Solicitors - governance	\$2,800	\$1,400	\$1,400
HR and Procurement	\$2,400	\$1,800	\$1,200
Accounting support	\$2,500	\$2,500	\$2,500
<b>SUBTOTAL</b>	<b>\$41,830</b>	<b>\$33,108</b>	<b>\$30,000</b>

In-kind contributions for Next 5 years (cont'd)	Year 1	Year 2	Year 3-5
<b>City Services Supports</b>			
Leisure Access - to city leisure centres	\$6,000	\$8,000	\$12,000
Transit (SAFE program/subsidized bus passes)	\$2,500	\$3,000	\$5,000
<b>SUBTOTAL</b>	<b>\$8,500</b>	<b>\$11,000</b>	<b>\$17,000</b>
<b>CBO supports</b>			
Staff time (total for multiple CBOs)	\$15,000	\$20,000	\$25,000
<b>SUBTOTAL</b>	<b>\$15,000</b>	<b>\$20,000</b>	<b>\$25,000</b>
<b>Meeting Room Space</b>			
City Meeting Rooms	\$1,000	\$1,000	\$1,000
Community Allies/CBOs mtg rooms	\$750	\$750	\$750
Institutional partners mtg rooms	\$500	\$500	\$500
<b>SUBTOTAL</b>	<b>\$2,250</b>	<b>\$2,250</b>	<b>\$2,250</b>
<b>Data sharing, analysis &amp; reporting- linking to existing technology</b>			
Project management/ITSM Software (city support)	\$1,500	\$1,500	\$1,500
Institutional partners	TBD	TBD	TBD
Community View	TBD	TBD	TBD
Community Allies/CBOs	TBD	TBD	TBD
Other Agencies - i.e. SIEC, etc	TBD	TBD	TBD
<b>SUBTOTAL</b>	<b>\$1,500</b>	<b>\$1,500</b>	<b>\$1,500</b>
<b>GRAND TOTAL</b>	<b>\$69,080</b>	<b>\$67,858</b>	<b>\$75,750</b>

### 8.1.2 Future Financing

Future funding for ConnectYXE will utilize a social financing model to ensure that the business model of the program will be sustainable. ConnectYXE will create a collective impact group to help with the social financing. This will involve a centralized infrastructure, a dedicated staff, and a structured process that leads to a common agenda, shared measurement, continuous communication, and mutually reinforcing activities among all participants. As we

have discovered throughout this phase, large-scale social change comes from better cross-sector coordination rather than from the isolated intervention of individual organizations. From the start of this program, we have received large support of community allies, CBOs and institutional partners who are committed to ensuring this program will be implemented. As ConnectYXE continues to evolve and connects to business and industry, we will leverage corporate social responsibilities to enhance the funding opportunities for ConnectYXE.

The social financing model being proposed will be consistent with the Collective Impact Initiative model. This is a collaborative model that shows long-term commitments by a group of key actors from different sectors that have a common agenda for solving specific social problems.<sup>17</sup> The funding received by the Smart Cities Challenge will act as a catalyst to allow the program to be piloted. It will demonstrate the social value that ConnectYXE creates through the data collection in the back end and the delivery data on the front end - with public kiosks and Wi-Fi supports. As this program is executed, we will partner with service providers and organizations who have been onboarded to the system,

to create a business case that will support the expansion of ConnectYXE and demonstrate the power of a collaborative effort. ConnectYXE can result in social investments and benefits well in excess of the initial \$10M investment.

## 8.2 Financial Reporting

The below table demonstrates how the \$250,000 finalist grant money was used and where the variances occurred from the original estimated budget of the finalist grant.

Program	Original	Projection to Project End	Variance from Original
Staffing & consultant support resources	\$95,000	\$108,000	\$13,000
Additional research & data collection	\$30,000	\$16,000	-\$14,000
Technology	\$50,000	\$-	-\$50,000
Prototype - pilot testing	\$25,000	\$2,500	-\$22,500
Project Manager	\$-	\$45,000	\$45,000
Community engagement and meeting supplies	\$25,000	\$18,000	-\$7,000
Communications - social media	\$7,500	\$-	-\$7,500
Professional services - legal/privacy	\$7,500	\$-	-\$7,500
Writing and design	\$10,000	\$30,000	\$20,000
Travel	\$-	\$17,000	\$17,000
Video Creation	\$-	\$9,000	\$9,000
Contingency	\$-	\$4,500	\$4,500
<b>TOTAL BUDGET</b>	<b>\$250,000</b>	<b>\$250,000</b>	<b>\$-</b>

17 John Kania & Mark Kramer, Collective Impact, Stanford Social Innovation Review, Winter 2011.



**Rationale for the change from the original budget is as follows:**

- **Staffing and consultant support resources**

Staffing and consultant support resources were increased with additional resources to current project staff as the project timeline was longer and more extensive than originally expected. In addition, honorariums were given to members of the Smart Cities Core Team to offset costs of time from work when needed to help with the Smart Cities process.

- **Additional Research and Data Costs**

The decrease in variance in this section was because of a decision to focus the scope of the project. While there was general agreement that the project needed more research and data undertaken, it was determined that at this proof of concept stage of the project, the initially proposed level of research and data was not required.

- **Technology**

Originally estimated to be \$50,000, the technology piece was not used in this portion because of several reasons: 1) ISM came on as a major partner offering \$40,000 of in-kind services with the technology portion; 2) A large portion of this amount was allocated to the IT Project Manager to help set up what the concept of the system would be; and 3) With the magnitude of the backend of

the system, it was decided that building a prototype in a short period would be under representative of what we would hope to achieve.

- **Prototype – pilot testing**

Prototyping was changed to a simple wireframe and proof of concept of the front-end portion of the tech solution as time did not allow for a full interactive prototype to be developed.

- **Project Manager**

This was a new item added to the contract to assist with project management. The complexity of this proposal required this additional team member.

- **Community Engagement and Meeting Supplies**

A significant portion of these expenses was used to support participation for the Indigenous youth involved in the process (by compensation for participation), as well as supplying supports to community allies. This portion also included honorariums to Youth Advisors on the core team as well as the Elder who attended the youth, community allies and institutional partners meetings.

The variance in this portion was because of in-kind services provided by community partners.

- **Communications – social media**

This portion of the budget was not used, all social media engagement costs were in-kind.



### • Professional Services – Legal/Privacy

The variances in professional services was again because of in-kind supports from ISM and the City Clerk's Office in helping to complete the privacy portion of the project. ISM had previously engaged in a program with the Province of Saskatchewan on a social innovation hub that helped to complete other legalities regarding the project.

### • Writing and Design

There was a variance in the writing and design portion. Costs for this portion increased due to the size of the proposal and the amount of design and graphics needed as well as adding in additional assistance in writing the report.

### • Travel

Travel requirements for the Smart Cities project were unknown when the orig-

inal budget was proposed. Travel has been added to allow for team members to speak at relevant conferences that are aligned with the project and for travel for jury check-ins and finalists showcase.

### • Video Creation

When the budget was built, this was also a requirement that was unknown in the original application and has now been allocated to fulfill this submission component.

### • Contingency

Contingency was added to offset any additional miscellaneous costs that came up during this phase of the project.

## 8.2.1 Finalist Grant In-Kind Contributions

The following is a breakdown of the finalist phase in-kind contributions we received:

Final Proposal Development In-Kind Supports   June 2018 to March 2019	
City staff time	
IT Project Management	\$13,400
IT - Operations	\$600
Community Development Staff	\$1,152
Mayor's Chief of Staff	\$15,120
Mayor's Office - Mtg logistics	\$1,440
Community Services Director/GM	\$14,400
Marketing - general supports PSA, social media	\$500
City Clerks (Privacy review)	\$1,500
Solicitors - Finalist contribution agreement	\$560
HR and Procurement	\$480
Accounting support	\$2,000
<b>SUBTOTAL</b>	<b>\$51,152</b>

<b>Final Proposal Development In-Kind Supports   June 2018 to March 2019 (cont'd)</b>	
<b>CBO supports</b>	
Staff time	\$15,000
<b>SUBTOTAL</b>	<b>\$15,000</b>
<b>Meeting Room Space</b>	
City meeting rooms	\$500
Community Allies/CBOs mtg rooms	\$250
Institutional partners mtg rooms	\$500
<b>SUBTOTAL</b>	<b>\$1,250</b>
<b>Technology supports</b>	
ISM - solutions components development	\$40,000
<b>SUBTOTAL</b>	<b>\$40,000</b>
<b>GRAND TOTAL</b>	<b>\$107,402</b>
<b>Additional supports unable to quantify</b>	
Institutional partners	
Community view	
Community Allies/CBOs	
Other agencies - i.e. SIEC, etc.	

### 8.3 Financials Risk

Risk management cuts across each of the sections of this proposal, and risks frequently overlap domains. As a result, we have consolidated the risks, and the discussion of the risk log in Section 9 “Risk Management”. That section shows those risks that, overall, received the highest impact profile: we have provided our current risk log in its entirety in Appendix Four: Entire Risk Log.

# 09 Risk Management

Risk is when an uncertain event or condition could occur and influence the program outcome. We have identified risks associated with the ConnectYXE program.

## 9.1 Risk Management Strategy

We track all risks associated with ConnectYXE program, and with each of the constituent projects. In both cases, we employ a common Risk Management Strategy comprised of 1) risk identification, 2) risk assessment, and 3) ongoing risk monitoring.

### 9.1.1 Risk Identification

The starting point in Risk Management is Risk Identification. This process is executed in the early stages of the Program, and of each project, and then repeated at regularly scheduled intervals thereafter. Risks are reported monthly in project status reports to the PMO, then aggregated and reported to IT Governance. The City methodology records risks in a Risk Register, shown in Figure 22.

### 9.1.2 Risk Assessed

**Once identified, the risk is assessed. This involves these seven steps:**

1. The risk is assigned one individual to be the risk owner.

**Program Risk Register**

**Risk Title**  
Provide a short description of the risk - include risk owner and the consequences

**Risk Statement**  
Describe the risk - both the risk itself, and the consequences if the risk happens

**Likelihood**  
What is the likelihood of this risk occurring?  
1 - unlikely to happen during 5 years of the program  
2 - May happen rarely, once or twice in the five years of the program  
3 - Occasional - expect this event to happen at least annually  
4 - Very likely this may happen multiple times annually  
5 - An almost certainty. This will happen, and/or frequently

**Impact**  
What are the impacts of this risk occurring?  
1 - Minimal impact on the program or its delivery  
2 - Moderate impact on the program or its delivery  
3 - Significant impact on the program or its delivery  
4 - Major impact on the program or its delivery  
5 - Catastrophic impact on the program or its delivery

**Risk Domain**

**Risk Owner**  
Who is accountable for managing and reviewing this risk, including updating the risk at this time and the risk owner's status

**Review Date**  
When is this risk due for review?

**Mitigation Strategies**  
Management Strategies  
Avoid  
Transfer  
Reduce  
Accept

**Possible impact for:**  
☐ Health and Safety to Youth  
☐ Health and Safety to CBO staff  
☐ Reputation of the City  
☐ Reputation of the CBO  
☐ Reputation of the City of Saskatoon  
☐ Reputation of the Government of Canada  
☐ Reputation of the Government of Saskatchewan  
☐ Reputational of Saskatoon  
☐ Reputational of Saskatoon CBO  
☐ Reputational of Saskatoon CBO  
☐ Reputational of Saskatoon CBO

FIGURE 22: PROGRAM RISK REGISTER

2. The risk likelihood is assessed. We use a 5-point scale to assess risk likelihood:

- 1 - Unlikely to happen during 5 years of the program
- 2 - May happen rarely -- once or twice in the five years of the program
- 3 - Occasional -- expect this event to happen at least annually
- 4 - Very likely. This may happen multiple times annually
- 5 - An almost certainty. This will happen, and/or frequently

3. The risk impact is assessed. Again, we use a 5-point scale, except that risk impact is calculated as an exponentially increasing value:

1 - A minor impact to the program or to a party or parties

2 - An impact to the program that will require resolution or remediation. Minor harm

4 - A recognizable impact to the program. Will attract attention, and/or may cause harm

8 - A serious impact that may cause substantial change to the program. Will attract high level attention and/or likely harm

16 - A catastrophic impact to the program and/or to the party or parties impacted. Potential loss of life or limb, and/or potential termination of the program

4. The overall risk profile is calculated as likelihood multiplied by impact.

5. A risk domain is assigned. This is the aspect of the program or of a project that the risk will impact. The choices are:

- Governance (Hindsight, Foresight, Oversight, including: Privacy, data...);
- Engagement (Stakeholder: CBO, Youth...);
- Engagement (Marketing, Communications and Change Management);

- Technology;
- Data and Privacy;
- Performance Measurement;
- Project Management;
- Finance; and
- Implementation Phase Requirements.

6. A risk trigger is identified. This is an event that will indicate that the risk is being realized, or that the conditions are in place for the risk to be realized.

7. Mitigation strategies are identified for those risks that have a risk profile of 8 or greater. There are four general categories of mitigation strategy:

- Avoid;
- Transfer;
- Reduce; or
- Accept.

We may have multiple mitigation strategies.

### 9.1.3 Risk Monitoring

Each project manager monitors and updates respective project risks. By assigning risk owners, and by establishing triggers, changes to risks will be recognized earlier giving the project team time to respond and/or to escalate the risk level.

Risk monitoring at a program level is administered by the PMO and reported

to the ConnectYXE Council. The PMO receives risk catalogues from respective projects, consolidates them, includes program risks, and reports the highest risks to the Council.

The ConnectYXE Council reviews risks with the highest risk profile. The Council may direct the PMO to apply new mitigation strategies to resolve, reduce or transfer risks.

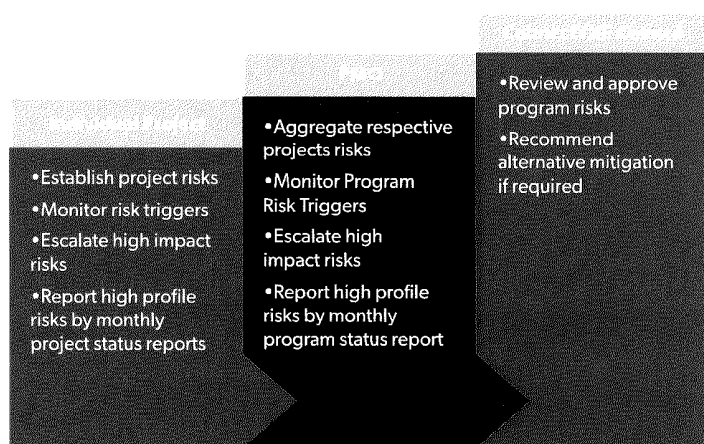


FIGURE 23: RISK LEVELS

## 9.2 Risk Register Showing the Highest Rated Risks

Using the Risk Management approach, we have identified 25 risks, some in each section of this proposal.

The complete Risk Register is included in Section 11.4 as “Appendix Four: Entire Risk Log.” Here we report on the top risks associated with each section.

Risk Title	Risk Statement	Impact	Likelihood	Risk	Mitigation Strategies
<b>Engagement (Marketing, Communications and Change Management)</b>					
Youth, a family member and/or an ally turn to ConnectYXE for an immediate, urgent need that the service does not, or does not yet, provide resulting in a failure to connect to an emergency service, or a delay, resulting in harm to an individual...	Youth, a family member and/or an ally may turn to ConnectYXE for an immediate, urgent need that the service does not, or does not yet, provide. Examples may include: reaching out for immediate medical aid, for mental health services, for a security concern. This might result in a failure, or at least a delay, in connecting to an emergency service and this could result in harm to an individual, damage to the reputation of ConnectYXE, and/or exposure of the service to poor publicity or to litigation.	4	2	16	<p>All emphasis must be placed on “Avoid” for this risk.</p> <p><b>Avoid:</b> Clear communication of the intention of ConnectYXE and emphasize what the service does not provide – or provide yet.</p> <p><b>Avoid:</b> Provide an option to connect to emergency services as an early option of the service.</p>

### Engagement (Stakeholder: CBO, Youth...)

Youth will not be aware that ConnectYXE exists, resulting in poor adoption	Youth have an overwhelming number of choices on the Internet - even when they are trying to locate services that ConnectYXE provides. If those youth, their families and their allies are not aware of ConnectYXE, adoption of the service will be threatened, CBOs will not be encouraged to participate, and overall, the program will languish and fail.	3	4	16	<p><b>Avoid:</b> Build into the plan a realistic adoption plan to ensure a gradual rollout, one that allows for adoption of each group in succession.</p> <p><b>Avoid:</b> Invest in effective and youth-led marketing that increases awareness of the benefits of the program to the youth (etc.) so as to promote adoption.</p> <p><b>Transfer:</b> Enlist our community allies and institutional partners in promoting adoption of the service, synchronized with the rollout plan to promote awareness, desire and adoption of the service.</p> <p><b>Reduce:</b> Establish a realistic adoption plan that does not over-reach or over-promise and delivers what it does promise.</p> <p><b>Accept:</b> A certain amount this risk is intrinsic to the nature of the project, and must be accepted.</p>
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### Technology

ConnectYXE must balance user accessibility and system development (providing meaningful services)	The project is an agile one and more input and requirements gathering is a need to develop the whole solution. The solution is valuable only when both CBOs provide valuable services, and youth are able to connect and use the system. Delivery of one or the other of these will not provide a functioning system. The solution developed must carefully balance the development of the services provided with the access to the system.	3	3	12	<p><b>Avoid:</b> Effective program governance establishes a balance between developing a robust back end solution and content provided by CBOs and institutional partners with a well-developed front end that makes the system accessible by youth.</p>
The Advanced Analytics that will extract meaningful data from disparate data sources is a new approach, attempting to solve a complex problem. This may not produce useful results in early stages of the program, resulting in loss of confidence in the approach.	<p>The Advanced Analytics that will extract meaningful data from disparate data sources is a new approach, attempting to solve a complex problem. This may not produce useful results in early stages of the program, resulting in loss of confidence in the approach.</p> <p>Some data sources will be very different from others. At the same time, we need to extract results which have a degree of nuance (e.g. gender, age, low-barrier) for these results to be meaningful. It may take some time and effort for the analytic tools to be tuned to provide that degree of nuance, which can result in delays, additional costs, and as a result loss of engagement.</p>	3	3	12	<p><b>Reduce:</b> Testing of the overall solution, and in particular, of the robustness of the solution sets, to address nuanced and complex circumstances will determine when the program can be released. Program governance will aim for a balance – the system must provide a basic level of robustness in addressing complex circumstances, but not delay implementation until the solution is “perfect”.</p>

### Project Management

Actual execution of the program is long – longer than we can sustain interest resulting in shifting priorities and less focus on ConnectYXE	Actual execution of the program is long – longer than we can sustain interest resulting in shifting priorities and less focus on ConnectYXE. ConnectYXE will take several months to establish governance, and several more to build core services – all before we produce visible results. Maintaining stakeholder interest through this time is a question of ensuring there are project activities relevant to stakeholders.	3	4	16	<p><b>Avoid:</b> Continually engaging with stakeholders and partners and scheduling deliverables early and throughout the program to maintain their engagement.</p>
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## Performance Measurement

Failure to meet milestones results in failure to request payments from Infrastructure Canada, resulting in cash flow challenges

Failure to meet milestones results in failure to request payments from Infrastructure Canada, resulting in cash flow challenges. This also threatens the timeline of the delivery of ConnectYXE services and benefits to the community.

3

3

12

**Avoid:** Good project management, and early identification of issues that threaten delivery.

**Avoid:** Careful alignment of project deliverables and outcomes with the cash flow requirements of the program will ensure that the City has a manageable demand to fund the program.

## Governance (Hindsight, Foresight, Oversight, including: Privacy, data...)

Youth advisors aging out of their advisory role, leaving the city, or turnover of staff representation in advisory and working groups resulting in the loss of the original vision

Youth advisors aging out of their advisory role, leaving the city, or turnover of staff representation in advisory and working groups resulting in the loss of the original vision or lack of fresh vision.

1

5

5

**Reduce:** Refresh insights on an ongoing basis, and broaden conversation to larger cohort groups. Set up mentoring process to bring on new advisors (youth and other). Recruitment and succession plans for the various governance groups.

## Data and Privacy

The quality of the information received from service providers is incomplete or inaccurate resulting in data that cannot be trusted and reduced confidence and uptake of the services.

The quality of the information received from service providers is incomplete or inaccurate resulting in data that cannot be trusted and reduced confidence and uptake of the services.

3

4

16

**Avoid:** User interface must be clear, easy, and intuitive for the service providers and must not require extensive additional work

**Avoid:** Well-defined onboarding and orientation processes including ongoing training for data entry

**Avoid:** Automated systems that identify inconsistent or inaccurate data

**Avoid:** Ongoing feedback that identifies inaccurate data

**Avoid:** Regular data review by the governance/ops team

**Avoid:** Clear requirements/screening for service providers as a part of onboarding

**Avoid:** Service providers become more proficient with and see the benefits of the system they will self-manage

**Accept:** Some data inconsistency is inevitable and processes must be identified to compensate

CBOs and institutional partners may fear that information shared could be used against participants or accessed by people they do not trust. For example, an organization's processes or areas of improvement could be shared with a key funder.

CBOs and institutional partners may fear that information shared could be used against participants or accessed by people they do not trust. For example, an organization's processes or areas of improvement could be shared with a key funder. This would result in reticence to onboard, reducing the services available, and ultimately, adoption.

3

3

12

**Avoid:** Clearly identify who has authority over the data that is shared and collected. Do not collect personally identifiable data. Confidentiality agreements as a part of the Data Sharing Agreement to provide peace of mind to participants, as appropriate.

## Finance

The greatest source of cost is in the technology that will provide the front-end and back-end solution where we have been able to give only high level estimates of cost. This may result in a solution that is not as developed as we currently plan.

The greatest source of cost is in the technology that will provide the front-end and back-end solution where we have been able to give only high-level estimates of cost. Our approach will be to balance development of front-end and back-end to provide a system that is usable as soon as we can, with the funding available. Given the uncertainty of the costs, current funding may take us to a point that is not as fully developed as we currently plan. This could result in reduced onboarding of partners and CBOs, and in reduced adoption by end users.

3

4

16

**Avoid:** More granular planning will allow us to optimize technology spending to arrive at an optimal solution.

**Reduce:** The need to spend additionally on technology will enable program governance to seek additional contributions for funding of the program.

## Implementation Phase Requirements

There is a risk we are unable to attract and/or retain Indigenous people to fill the key positions for ConnectYXE

ConnectYXE is designed to address the needs of Indigenous youth, families and allies. We plan for significant participation from Indigenous youth or Indigenous peoples to better reflect the perspective and needs of this community as the program is developed and delivered. There is a risk that we will not be able to attract Indigenous peoples to the executive roles (Program Manager, Technical Director, Administrator or Program Coordinator), or to keep individuals in these roles.

3

4

16

**Avoid:** The approach to procuring staff provides for weighting of results for individuals who are from CEB identified groups, with a focus on representation from Indigenous Peoples.

**Transfer:** We will work with community allies, asking them for help in identifying Indigenous candidates for program roles, and for help in encouraging those individuals to apply.

**Reduce:** We will create incentives to support individuals who apply for roles that are new to them, including opportunities for mentorship and training in these new roles.

**Accept:** We will aspire to fill executive roles with Indigenous peoples, but will accept that we may have to fill program roles with other CEB target groups in order to keep the program moving forward.



# 10 Implementation Phase Requirements

We are committed to honouring our Treaty responsibilities and moral Duty to Consult throughout this proposal process. We have an Elder for this project and for each meeting with our institutional partners, community allies, and Youth Advisory Group we have offered tobacco to him to open and close the gathering. When the youth asked for sharing circles, he also began each circle with a smudge. We will continue to practice respectful and meaningful consultation with all of our partners, allies, and youth, and continue to ask for guidance and teachings from our Elder.

## 10.1 Treaty Responsibilities and The Duty to Consult: Background

The governing structure and organization of the Plains Cree of Treaty 6 Territory is embedded with a strong ethic of citizenship consultation. Supporting the leadership structure is a complex system of research, dialogue, analysis, and consensus. There are societies, councils and Elders who are expected to provide input into the major governing decisions faced by their leaders.<sup>18</sup> In preparation for significant decisions, such as the treaty talks in 1876, leaders provided

the citizenship with the information required to work towards a negotiable position on issues of welfare, medicine chest, land relationship, education, and compensation.<sup>19</sup> Wrapped in a cloak of wāhkōtowin and pimācihowin (making relations and livelihood),<sup>20</sup> the system works for the Cree nation. In most cases, the decisions reached through these processes are supported by spiritual practices, ceremonies and teachings.

## 10.2 Duty to Consult

The legal definition for the Duty to Consult reached by the Canadian courts and implemented through Canadian government policy falls short of the Cree teachings about the necessity for community engagement when major decisions are being reached for the growth and welfare of the community. In cases like Canada's attempted consultation process on First Nations Education (2016), the First Nations resisted the process declaring that it was too narrow in scope, lacking the complexity of their own consultation processes.

18 Muskeg Lake Election Act. 1999.

19 "The chiefs and leading men at Fort Carlton believed that they had signed, on behalf of the Indian nations they represented, a treaty to share the land with the settlers and to keep the peace with the government, amongst themselves, and with the newcomers... They were all of them 'children of the Queen,' of the same blood, and had been made by the same God... Spoken in the presence of the sacred pipe, they believed that the promises made by the lieutenant-governor could not be broken." (Christensen. Ahtahkakoop. 2000, p. 273).

20 Cardinal, H. & Hildebrand, K. Treaty Elders of Saskatchewan. OTC, 2000.

### 10.3 Truth and Reconciliation Calls to Action

The pressure coming from the publication of the 94 Calls to Action by the Truth and Reconciliation Commission (2016) is generating its own energy to bring about change in Canada.<sup>21</sup>

ConnectYXE, by both connecting more people to appropriate services, as well as collecting comprehensive data of these activities, would help Saskatoon make progress on TRC Calls to Action 1, 19, 30, 38, 39, 40, 55, and 66. The most direct impacts would be on:

30. We call upon federal, provincial, and territorial governments to commit to eliminating the overrepresentation of Aboriginal people in custody over the next decade, and to issue detailed annual reports that monitor and evaluate progress in doing so.

38. We call upon the federal, provincial, territorial, and Aboriginal governments to commit to eliminating the overrepresentation of Aboriginal youth in custody over the next decade.

### 10.4 Reconciliation

The City has recognized that reconciliation is the way forward for a harmonious community, bringing to life the Treaty 6 clause calling for peaceful co-existence.

Saskatoon City Council declared 2015 as the **Year of Reconciliation** and subsequently supported the development of **Reconciliation Saskatoon**, a continuously growing network of 70 organizations committed to active reconciliation in the city.

Since 2015, a number of City projects have explored different opportunities for greater citizenship engagement across a very diverse population.<sup>22</sup> The efficiency of decision making is affected by a deeper more complex approach to data collection. The new engagement processes also bring ownership of the City to the citizens of Saskatoon.

Data collection and data management are key components for any planning process. Building a database that has engaged several layers of citizens with a wide spectrum of perspectives is important, especially the engagement of the potential beneficiaries of a project. This relationship between reconciliation and data collection, to improve well-being for members of our community, is the foundation of ConnectYXE.

### 10.5 Treaty Relationship

The medicine chest clause is a way forward to understand the distance between Canadian administration of health care and Indigenous interpretation of the spirit and intent of Treaty 6. In this con-

<sup>21</sup> The current political climate and stated position of the federal government on an agenda of "government to government" relations challenges Canadians to plan forward on this base: "We are all in this together, and the relationships we build need to reflect this reality. In Canada, this means new relationships between the government of Canada and Indigenous Peoples – relationships based on recognition of rights, respect, cooperation and partnerships." (Prime Minister Justin Trudeau's Address to the 72th session of the United Nations General Assembly, September 21, 2017.)

<sup>22</sup> Naming of Libraries (2017); Bridge Naming Project (2017-2018); Victoria Park Reconciliation Sculpture Project (2017-2018)

text, Indigenous holistic understanding of wellness provides the service providers an opportunity to merge and balance the distance between the two worldviews on wellness of the individual, family and community. The governing processes of the City with its priority to dialogue towards a collaborative strategy with Indigenous individuals, communities and organizations is creating the type of environment required to formulate strategic plans towards setting a higher standard in the quality of life for all its citizens.

The Treaty 6 Flag that was raised with a pipe ceremony in front of Saskatoon City Hall is a bold announcement to the citizens of Saskatoon. The way forward is an organized strategy to meaningfully recognize what it means to be a Treaty 6 member, and to have consultation processes that honour the ability of the Saskatoon citizen to contribute to building a Smart City that benefits everyone.

## **10.6 Climate Lens Assessment**

The climate lens assessment only applies to proposals that focus on climate change mitigation or adaptation. The ConnectYXE proposal does not focus on either of these areas and so does not include a climate lens assessment.

## **10.7 Community Economic Benefit Lens of Procurement**

The ConnectYXE program will provide a Community Employment Benefit (CEB), as defined by the Investing in Canada

Plan. The program will plan to hire an Indigenous person in the role of Project Coordinator. Over the course of the five-year program, this person will be given the opportunity to transition into the role of Technical Director. The program will provide for the training required to complete the coursework component of the Project Management Professional (PMP) certification (40 hours of training), will be mentored by the Program Director, and will be invited to join the Project Management Community of Practice sponsored by the IT Department of the City.

*If a province or territory indicates that the project will be participating in the initiative, then a specific target for the benefits that will be provided for at least three of the federal target groups (apprentices; Indigenous peoples; women; persons with disabilities; veterans; youth; recent immigrants; and small-sized, medium-sized and social enterprises) will be required for the project.*

Under the Smart Cities Challenge, the City is outlining our procurement approach to meeting CEB participation and reporting requirements.

The City will work cooperatively with key stakeholders to advance corporate social responsibility in the business community by promoting our policy and encouraging suppliers and subcontractors to work towards the social, economic, and environmental objectives of the City.

The City's Purchasing Policy stipulates that we will procure goods and services.

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and promote and participate in viable procurement opportunities with diverse and Indigenous suppliers.

The City is committed to working with targeted groups throughout Saskatchewan to promote the procurement of goods and services from diverse individuals and businesses. To this end, the following will be evaluated as part of our ConnectYXE Procurement Initiatives:

A proponent wishing to be evaluated and awarded scores for CEB participation will provide the City with a completed participation form that will be attached to our RFX bid package as an Appendix. The City reserves the right to not award any scores to any proponent in respect of CEB participation when the proponent does not provide sufficient information, as required by the City and Smart Cities challenge.

Consistent with Supply Chain Management processes, during the performance of the services the contractor will provide the City of Saskatoon with a written monthly report which outlines information (in detail reasonably satisfactory to the City) establishing the contractor's compliance with its CEB commitments and contractual obligations.

# 11 Appendices

## 11.1 Appendix One: Preliminary Privacy Impact Assessment

### 1. General

<b>Name of Department/Division</b>	Strategy and Transformation/Information Technology
<b>Project Lead(s)</b>	Jazz Pabla
<b>Title</b>	ConnectYXE

### 2. Description of the project including the purpose and objectives:

In response to the Federal Government's (Infrastructure Canada's) Smart Cities Challenge, the City has proposed a program that, should the City be selected as a winner, will execute over the course of the next 5 years. We have branded this program "ConnectYXE".

The mission statement of this program is "To be the city that breaks the cycle of Indigenous youth incarceration by creating a new cycle focused on building purpose, belonging, security and identity."

The technical solution proposed is to establish an independent board (incorporated or not) to provide governance over the engagement with community-based organizations (CBOs) and institutional partners, and to connect the services provided by those partners so that they are available to Indigenous youth, their families and to their "allies" – those who support and help them.

Users of the system – Indigenous youth, their families and allies – will not be required to authenticate, nor to provide personal information about themselves.

A dimension of the program is to improve access to the internet in areas of highest concentration of Indigenous youth and families by providing free Wi-Fi in strategically selected neighbourhoods and kiosks in locations where youth "hang out". Access to the free Wi-Fi will not collect IP Addresses. Rather, raw data regarding how many individuals use the free Wi-Fi will be collected.

### **3. What type of information is involved in the project?**

All information that will be contained by the ConnectYXE system will be data provided by CBOs and institutional partners. CBOs will remove any PI/PHI prior to disclosing any information to ConnectYXE. This data is encrypted as transmitted and at rest, and will be securely segregated within the ConnectYXE system, accessible only by the CBO who disclosed the data, and by the information management service provider, ISM Canada.

Departments of City of Saskatoon, Saskatoon Transit, and Saskatoon Recreation and Community Development will provide data that is available to the public and does not contain any PI.

As a part of the ConnectYXE program, we will provide free public Wi-Fi to a neighbourhood of Saskatoon. ConnectYXE will ensure appropriate network protocols are in place so that only internet data ("HTTP" or "HTTPS") is transmitted, which will limit access to devices onto the LAN side. DHCP will be set to provide IP addresses with a lease of 8 hours, so that IP addresses will not be associated with a specific LAN. Host names will not be exposed. Free public Wi-Fi may be contracted to an Internet Service Provider such as Shaw or Sasktel; this provider would provide additional network data protection services.

End users will connect to ConnectYXE by phone or by an internet connection. Users will not be required to identify

themselves. Depending on the nature of the interaction, the user may be asked to provide their age (not their date of birth), and their gender. If the interaction is such that the individual's location is required, this may be requested. If the interaction results in a requirement to send a transit ticket, the user's phone number may be requested so as to send an electronic ticket. This data will be used for the purposes of the transaction. Phone number and information that identifies the device (such as IP address) will not be retained; other data will be stored as aggregated data only. This data cannot be used to identify a specific individual, and so is not considered PI.

### **4. How will the information be used?**

The Information Management Service Provider, ISM Data Lab, uses Artificial Intelligence tools that mine the CBO data and extracts services provided by CBOs. Following processing, all source data extracted and analyzed by the Data Lab will be destroyed; only the aggregated results – the list of services available and other data surrounding and supporting these services – will be preserved.

### **5. Questions:**

**1 - Does the project involve any type of confidential information? (i.e. personal, sensitive third party or other confidential information)**

No. No. CBOs will remove any PI/PHI prior to disclosing any information to ConnectYXE. As CBOs are onboarded,

the ConnectYXE Council will conduct a pre - privacy impact assessment and a data sharing agreement with each CBO. This assessment will determine if the CBO data contains any PI/PHI. If it does, we will work with the CBO to develop a process whereby that data is removed before transmission.

We will subsequently monitor the data that is submitted to look for any PI/PHI; if found, it will be removed, and treated according to the protocols for a data and privacy breach.

**2 - Is this a new program or service?**

Yes. ConnectYXE is a proposal for the national Smart Cities Challenge. If it is a successful winner it will be a new service that connects youth, families and allies to additional CBOs.

**3 - Are you making significant changes to an existing program or service?**

No. This is a new service, that is modelled after the provincial Social Innovation Hub.

**4 - If this project relates to an existing project was a full PIA completed? If so what is the project's name?**

This does not relate to any existing project of the City of Saskatoon.

**5 - Will you be data linking with other information within the City?**

Yes. Yes, there will be aggregation of data provided from multiple CBOs and institutional partners. No linked

data will contain PI/PHI because ConnectYXE does not have any.

**6 - Will the project contract out any function?**

Yes. ISM is our technology partner in this program. Upon being awarded the Smart City Challenge, the City of Saskatoon will form a governing body (the ConnectYXE Council) which will enter into an agreement with ISM Canada and will formalize the Information Management Service Provider service agreement.

**7 - Will there be a collection of any personal, third party, or other confidential information via web-based technology?**

No. If they have any, CBOs will remove PI/PHI prior to disclosing any information to ConnectYXE.

**8 - Are you using personal information to determine eligibility for a program or service or for enforcement?**

No. ConnectYXE provides a list of services available for end users. No personal information will be used to determine eligibility for a program or service, nor for enforcement.

**9 - Will the personal information be shared outside the organization?**

No. No PI/PHI from the City of Saskatoon will be disclosed.

**10 - Will the personal information be stored outside the organization?**

No. Data from respective CBO will be stored in ConnectYXE, which “resides” in the Microsoft Azure Cloud. This data is partitioned and not accessible to anyone except the CBO providing the data, and by the ISM Data Lab. ISM is an Information Management Service Provider (IMSP) as defined by LAFOIP. CBOs will disclose only data that does not include PI/PHI into the system.

City of Saskatoon will not disclose any PI to ConnectYXE.

**11 - Will the personal information be used for other purposes, including research and statistical purposes?**

No. No identifiable PI/PHI will be collected, disclosed or used for any other purpose.

**12 - Will the public be likely to have any privacy concerns regarding the project or the service that is being offered by the City?**

Yes. During the engagement consultations with Indigenous groups there were expressions of privacy concerns. We will provide communications and notice of the IMSP agreement as evidence the data is not PI or PHI and is encrypted in transit, at rest, that the data are segregated and not accessible by others.

**13 - Are you introducing changes to the business systems or infrastructure architecture that:**

- **Affects the physical or logical separation of personal information.**

No. CBOs will remove any PI/PHI prior to disclosing any information to ConnectYXE.

• **Changes the security mechanism used to manage and control access to personal information?**

No. The system will introduce a net new system that will store data segregated by CBO, including a security mechanism used to access these data (by the CBO and by the ISM Data lab). CBOs will remove any PI/PHI prior to disclosing any information to ConnectYXE.

**14 - Are there any other or additional reason for undertaking a PIA? If yes please explain.**

Inasmuch we are importing data from CBOs, the process of onboarding those parties would each entail a PPIA. ConnectYXE will provide solutions regarding how the CBOs will ensure PI/PHI is not disclosed to ConnectYXE.

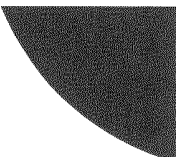
**6. Legislative Authority of ConnectYXE Proposal**

**Principle:**

The City of Saskatoon is a local authority as defined by section 2(f) of The Local Authority Freedom of Information and Protection of Privacy Act (LAFOIP). ConnectYXE will be a program of the City and will, therefore, be subject to the provisions of LAFOIP.

ConnectYXE will not be collecting PI or PHI; therefore, the data that will be disclosed by CBOs or institutional partners










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will be restricted to data fields that do not include PI/PHI or from which one can infer identifiable PI/PHI. It will be the CBOs that ensure the data fields disclosed to ConnectYXE do not include PI/PHI. ConnectYXE will monitor collected data, looking for incidental PI/PHI. If such incidental disclosure occurs, the City will undertake a privacy breach investigation following the City's Privacy Breach Protocol Guidelines.

ConnectYXE will conduct an extensive privacy impact assessment should they be the successful winner of the Smart Cities Challenge.

## Signatures

<b>Project Lead Name &amp; Title</b>	Michelle Beveridge Chief of Staff, Mayor's Office
<b>Signature</b>	
<b>Date</b>	Feb 14, 2019
<b>IT Project Lead Name &amp; Title</b>	Jazz Pabla Manager of Technology Integration
<b>Signature</b>	
<b>Date</b>	Feb 14, 2019
<b>Director of IT Name</b>	Paul Ottmann Director of IT
<b>Signature</b>	
<b>Date</b>	Feb 14, 2019
<b>Access and Privacy Officer</b>	Wenda Atkinson Access and Privacy Officer
<b>Signature</b>	
<b>Date</b>	Feb 14, 2019
<b>Comments</b>	Full PIA is required should the City be the successful winner of the Smart Cities Challenge
<b>General Manager Name</b>	Lynne Lacroix Acting General Manager, Community Services
<b>Signature</b>	
<b>Date</b>	Feb 14, 2019

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## **Response from the Office of the Saskatchewan Information and Privacy Commissioner**

The following response was provided to the City of Saskatoon Data and Privacy Office on Monday, March 4th, indicating the engagement of the team with the OIPC.

*..., this email is to confirm that our offices have engaged in telephone calls on February 11 and 25, 2019, and that we receive various documents, including a copy of the City's finalist proposal and PPIA, on February 15 and 27, 2019.*

*We are currently drafting our response letter to the City which will include comments on the City's final proposal and PPIA. We hope to have this draft sent to you sometime this week. A final version of our letter will be prepared after you have read our draft. The final letter will be provided to you, with a c.c. to Infrastructure Canada before the April 9, 2019 deadline.*

*If you have any questions or need any information, please do not hesitate to contact me.  
Thank you,*

*Marjorie Platero*

*306-798-2360*

## 11.2 Appendix Two: Truth and Reconciliation Calls to Action

The pressure coming from the publication of the **94 Calls to Action by the Truth and Reconciliation Commission (2016)** is generating its own energy to bring about change in Canada.<sup>23</sup>

ConnectYXE, by connecting more people to appropriate services, and collecting comprehensive data of these activities, would help Saskatoon make progress on TRC Calls to Action 1, 19, 30, 38, 39, 40, 55, and 66. The most direct impacts would be on:

1. We call upon the federal, provincial, territorial, and Aboriginal governments to commit to reducing the number of Aboriginal children in care by:

- i. Monitoring and assessing neglect investigations.
- ii. Providing adequate resources to enable Aboriginal communities and child-welfare organizations to keep Aboriginal families together where it is safe to do so, and to keep children in culturally appropriate environments, regardless of where they reside.

19. We call upon the federal government, in consultation with Aboriginal peoples, to establish measurable goals to identify and close the gaps in health outcomes between Aboriginal and non-

Aboriginal communities, and to publish annual progress reports and assess long-term trends. Such efforts would focus on indicators such as: infant mortality, maternal health, suicide, mental health, addictions, life expectancy, birth rates, infant and child health issues, chronic diseases, illness and injury incidence, and the availability of appropriate health services.

30. We call upon federal, provincial, and territorial governments to commit to eliminating the overrepresentation of Aboriginal people in custody over the next decade, and to issue detailed annual reports that monitor and evaluate progress in doing so.

38. We call upon the federal, provincial, territorial, and Aboriginal governments to commit to eliminating the overrepresentation of Aboriginal youth in custody over the next decade.

39. We call upon the federal government to develop a national plan to collect and publish data on the criminal victimization of Aboriginal people, including data related to homicide and family violence victimization.

40. We call on all levels of government, in collaboration with Aboriginal people, to create adequately funded and accessible Aboriginal-specific victim programs and services with appropriate

<sup>23</sup> The current political climate and stated position of the federal government on an agenda of “government to government” relations challenges Canadians to plan forward on this base: “We are all in this together, and the relationships we build need to reflect this reality. In Canada, this means new relationships between the government of Canada and Indigenous Peoples – relationships based on recognition of rights, respect, cooperation and partnerships.” (Prime Minister Justin Trudeau’s Address to the 72th session of the United Nations General Assembly. September 21, 2017.)

evaluation mechanisms.

55. We call upon all levels of government to provide annual reports or any current data requested by the National Council for Reconciliation so that it can report on the progress towards reconciliation. The reports or data would include, but not be limited to:

iii. The educational and income attainments of Aboriginal peoples in Canada compared with non- Aboriginal people.

iv. Progress on closing the gaps between Aboriginal and non-Aboriginal communities in a number of health indicators such as: infant mortality, maternal health, suicide, mental health, addictions, life expectancy, birth rates, infant and child health issues, chronic diseases, illness and injury incidence,

and the availability of appropriate health services.

v. Progress on eliminating the overrepresentation of Aboriginal children in youth custody over the next decade.

vi. Progress on reducing the rate of criminal victimization of Aboriginal people, including data related to homicide and family violence victimization and other crimes.

vii. Progress on reducing the overrepresentation of Aboriginal people in the justice and correctional systems.

66. We call upon the federal government to establish multiyear funding for community-based youth organizations to deliver programs on reconciliation, and establish a national network to share information and best practices.

### 11.3 Appendix Three: City of Saskatoon Procurement Rating Criteria

The City of Saskatoon will evaluate Requests for Proposals and Request for Quotations using a ranking system that includes Community Economic Benefit. This awards points for responders who represent a diverse or indigenous perspective.

Rated Criteria Category		Weighting (Points)
<b>A.4.1</b>	Pricing	60
<b>A.4.2</b>	Experience/References	15
<b>A.4.3</b>	Project Approach	10
<b>A.4.4</b>	<b>Community Economic Benefit</b>	<b>15</b>
<b>A.4.4.a</b>	Diverse or Indigenous Person Hours	10/15
<b>A.4.4.b</b>	Diverse or Indigenous Ownership, Social Enterprise	3/15
<b>A.4.4.c</b>	Diverse Community Investment (Including Apprenticeship, Education, and Training)	2/15
<b>Total Points</b>		<b>100</b>

Note: The rating criteria and weightings utilized above are for illustrative purposes only. The final rating criteria and weightings will be determined per the project scope and goals but will include the CEB criteria set out above as a minimum.

## 11.4 Appendix Four: Entire Risk Log

Risk Title	Risk Statement	Impact	Likelihood	Risk	Mitigation Strategies
<b>Engagement (Marketing, Communications and Change Management)</b>					
Youth, a family member and/or an ally turn to ConnectYXE for an immediate, urgent need that the service does not, or does not yet, provide resulting in a failure to connect to an emergency service, or a delay, resulting in harm to an individual.	Youth, a family member and/or an ally may turn to ConnectYXE for an immediate, urgent need that the service does not, or does not yet, provide. Examples may include: reaching out for immediate medical aid, for mental health services, for a security concern. This might result in a failure, or at least a delay, in connecting to an emergency service and this could result in harm to an individual, damage to the reputation of ConnectYXE, and/or exposure of the service to poor publicity or to litigation	4	2	16	<p>All emphasis must be placed on "Avoid" for this risk.</p> <p><b>Avoid:</b> Clear communication of the intention of ConnectYXE and emphasize what the service does not provide -- or provide yet.</p> <p><b>Avoid:</b> Provide an option to connect to emergency services as an early option of the service.</p>
Youth may request a service that the system does not offer, reducing his or her confidence in the system.	Youth may request a service that the system does not offer, reducing his or her confidence in the system. Repeated experience may result in the youth abandoning the system altogether.	2	4	8	<p><b>Avoid:</b> Track requests and determine frequently requested services. Prioritize the onboarding of these services.</p> <p><b>Avoid:</b> Provide an option very clearly on the interface that allows the user to connect directly to the service provider.</p> <p><b>Avoid:</b> Do not release the service until governance (esp. youth) agree that there is sufficient value.</p> <p><b>Transfer:</b> Transfer responsibility of locating services not provided to the youth themselves. The existence of the system will not change the status quo; services that cannot be located now will be challenging to locate after the system is available.</p> <p><b>Reduce:</b> Manage expectations by providing a clear communication built into the system advising that the services are limited</p> <p><b>Reduce:</b> Be clear in all communications that ConnectYXE is a connecting service -- and does not itself offer services</p> <p><b>Accept:</b> This risk will be difficult to avoid. The system will take a long time (years) to onboard a significant set of services.</p>
Community/end users don't understand exactly what ConnectYXE is resulting in unrealistic and unmet expectations resulting in reduced adoption	<p>Community/end users don't understand exactly what ConnectYXE is. For example, they expect that ConnectYXE is responsible for the delivery of the services rather than simply connecting the user to the service.</p> <p>This could result in unrealistic and unmet expectations resulting in reduced adoption.</p>	2	4	8	<p><b>Avoid:</b> Communication strategy clearly articulates the intention of the program</p> <p><b>Transfer:</b> Partners need to clearly communicate the intention of the program</p> <p><b>Accept:</b> A certain amount is to be expected and accepted</p>

This project is mimicking existing services. This may lead to confusion as to who is offering what service, and reduced adoption.	What is the difference between this system and other initiatives that have been undertaken.	2	4	8	<p><b>Avoid:</b> Good communication should position ConnectYXE correctly in people's minds.</p> <p><b>Transfer:</b> Partner organizations having a clear understanding will allow them to communicate the distinction.</p>
Some may question why the program focuses on Indigenous youth and not all youth? This may lead to resentment, negative publicity and political pressure to change the program.	Some may question why the program focuses on Indigenous youth and not all youth? This may lead to resentment, negative publicity and political pressure to change the program.	2	3	6	<p><b>Avoid:</b> Communication material and key messages that explain how designing for those with the most systemic barriers will help meet the needs of all.</p>
<b>Engagement (Stakeholders)</b>					
Youth will not be aware that ConnectYXE exists, resulting in poor adoption.	Youth have an overwhelming number of choices on the Internet - even when they are trying to locate services that ConnectYXE provides. If those youth, their families and their allies are not aware of ConnectYXE, adoption of the service will be threatened, CBOs will not be encouraged to participate, and overall, the program will languish and fail.	3	4	16	<p><b>Avoid:</b> Build into the plan a realistic adoption plan to will ensure a gradual rollout, one that allows for adoption of each group in succession.</p> <p><b>Avoid:</b> Invest in effective and youth-led marketing that increases awareness of the benefits of the program to the youth (etc.) so as to promote adoption.</p> <p><b>Transfer:</b> Enlist our community allies in promoting adoption of the service, synchronized with the rollout plan to promote awareness, desire and adoption of the service.</p> <p><b>Reduce:</b> Establish a realistic adoption plan that does not over-reach or over-promise and delivers what it does promise.</p> <p><b>Accept:</b> A certain amount this risk is intrinsic to the nature of the project, and must be accepted.</p>
Key CBO stakeholders concerned that the money could be better spent on direct delivery of programs and services, may not wish to get involved, resulting in reduced engagement and an incomplete set of services, and a reduced quality of the program.	Key CBO stakeholders concerned that the money could be better spent on direct delivery of programs and services, may not wish to get involved, resulting in reduced engagement and an incomplete set of services, and a reduced quality of the program. This in turn would result in reduced adoption.	2	3	6	<p><b>Avoid:</b> During the engagement process, clear communication of the value of coordinating existing services, and that this does not preclude requesting funding for additional services: in fact, we can provide quantified evidence of the need for additional services.</p>
The program may suffer from "Stakeholder fatigue" – feeling like this is just another thing the City wants from them – resulting in reduced onboarding, reduced quality of service, and hence reduced adoption.	Stakeholder fatigue – feeling like this is just another thing the City wants from them, or that they were part of other collaborative initiatives in the past that didn't go anywhere. Lack of trust in the process, avoiding fatigue/drain.	2	2	4	<p><b>Avoid:</b> Early involvement in the project, so that they can see the impact of their participation as the project takes shape.</p> <p><b>Avoid:</b> Use the language and lens of the stakeholder group to build trust and resonance.</p> <p><b>Avoid:</b> Clearly identifying where the opportunities are to influence the process, demonstrating results, and communicating the path forward.</p>

## Technology

ConnectYXE must balance user accessibility and providing meaningful services.	The project is an agile one and more input and requirements-gathering is needed to develop the whole solution. The solution is valuable only when both CBOs provide valuable services, and youth are able to connect and use the system. Delivery of one or the other of these will not provide a functioning system. The solution developed must carefully balance the development of the services provided with the access to the system.	3	3	12	<b>Avoid:</b> Effective program governance establishes a balance between developing a robust back end solution and content provided by CBOs and institutional partners with a well-developed front end that makes the system accessible by youth.
The Advanced Analytics that will extract meaningful data from disparate data sources is a new approach, attempting to solve a complex problem. This may not produce useful results in early stages of the program, resulting in loss of confidence in the approach.	The Advanced Analytics that will extract meaningful data from disparate data sources is a new approach, attempting to solve a complex problem. This may not produce useful results in early stages of the program, resulting in loss of confidence in the approach.  Some data sources will be very different from others. At the same time, we need to extract results which have a degree of nuance (e.g. gender, age, low-barrier) for these results to be meaningful. It may take some time and effort for the analytic tools to be tuned to provide that degree of nuance, which can result in delays, additional costs, and as a result loss of engagement.	3	3	12	<b>Reduce:</b> Reduce: Testing of the overall solution, and in particular, of the robustness of the solution sets to address nuanced and complex circumstances will drive when the program can be released. Program governance will aim for a balance -- the system must provide a basic level of robustness in addressing complex circumstances, but not delay implementation until the solution is "perfect."
Providing Wi-Fi to a neighbourhood may appear to be an intrusion, or worse, as an invasion of privacy, resulting in negative publicity around the program, negatively impacting the reputation of the Smart Cities Challenge, and/or the City.	Without careful change management, consultation and acceptance, installing Wi-Fi might be viewed by some in our identified neighbourhoods as a means of surveillance or monitoring. This could result in negative publicity surrounding the program, the Smart Cities Challenge, and/or the City of Saskatoon.	3	2	8	<b>Avoid:</b> Clear communication to the residents in the identified neighbourhood of our intention to provide free public Wi-Fi with information about the impact on their privacy.  <b>Avoid:</b> Public consultation before we proceed. Gain broad consensus from the residents of the identified neighbourhood that we should proceed with free public Wi-Fi.  <b>Avoid:</b> Follow-up communication after Wi-Fi access points have been installed that reiterates the security and the steps taken to respect privacy in providing the service.
Natural Language Processing to translate vernacular speech into meaningful queries is an untested solution. Its use may result in frustrations among end users, and a corresponding lack of adoption.	Natural Language Processing -- whether voice or Chatbot -- is required to translate vernacular speech into meaningful queries against the services that the system maintains. This has not been directly tested. Many of us have experience of these systems that is frustrating. If the user interface is not useful to end users, adoption of the system will suffer.	2	3	6	<b>Reduce:</b> The user interface will improve as it has more and more interactions. The challenge for Program Governance is to release the program to end users at a point where it is useful, if not perfect, in all circumstances.



## Project Management

Actual execution of the program is long – longer than we can sustain interest, resulting in shifting priorities and less focus on ConnectYXE.	Actual execution of the program is long – longer than we can sustain interest, resulting in shifting priorities and less focus on ConnectYXE. ConnectYXE will take several months to establish governance, and several more to build core services – all before we produce visible results. Maintaining stakeholder interest through this time is a question of ensuring there are project activities relevant to stakeholders.	3	4	16	<b>Avoid:</b> Continually engaging with Stakeholders and Partners and scheduling deliverables early and throughout the program to maintain their engagement.
Project Management approach will be new for some participants. Collaborating on a project will be a new skill and may take time to acquire, resulting in possible delays to the earlier stages of the program.	Project Management approach will be new for some participants. Collaborating on a project will be a new skill and may take time to acquire, resulting in possible delays to the earlier stages of the program.	3	2	6	<p><b>Avoid:</b> Provide orientation and training to project resources and partners that are not familiar with project management or collaboration tools to develop enough proficiency in the use of the tools.</p> <p><b>Transfer:</b> Request support from project management resources within the partner organizations for project participants in developing PM skills.</p> <p><b>Reduce:</b> The City-based PMO can undertake to backfill project-related tasks until partner team members are able to develop the needed skills.</p>

## Performance Measurement

Failure to meet milestones results in failure to request payments from Infrastructure Canada, resulting in cash flow challenges.	Failure to meet milestones results in failure to request payments from Infrastructure Canada, resulting in cash flow challenges. This also threatens the timeline of the delivery of ConnectYXE services and benefits to the community.	3	3	12	<p><b>Avoid:</b> Good Project Management, and early identification if issues that threaten delivery.</p> <p><b>Avoid:</b> Careful alignment of project deliverables and outcomes with the cash flow requirements of the program will ensure that the City will have a manageable demand to fund the program.</p>
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## Governance (Hindsight, Foresight, Oversight, including: Privacy and data)

Youth advisors aging out of their advisory role or leaving the city or turnover within staff representation of various advisory and working groups resulting in the loss of the original vision.	Youth advisors aging out of their advisory role or leaving the City or turnover within staff representation of various advisory and working groups resulting in the loss of the original vision or lack of fresh vision.	1	5	5	<b>Reduce:</b> Refresh insights on an ongoing basis, and broaden conversation to larger cohort groups. Set up mentoring process to bring on new advisors (youth and other). Recruitment and succession plans for the various governance groups.
Competencies of governance partners do not meet the needs of the project resulting in poor decision making.	Competencies of governance partners do not meet the needs of the project resulting in poor decision making. We have no control over the representatives from the partners to the governance structure. For example, they may come with their own agendas, take no ownership, lack a full understanding of the project. If the reps do not fulfill their role, this results in a lack of accountability and/or clarity for the Program Team.	2	2	4	<p><b>Avoid:</b> clear criteria for partner representation, orientation sessions for partner reps, clear definition of partner commitments and benefits.</p> <p><b>Avoid:</b> strategic relationship building.</p> <p><b>Avoid:</b> annual assessment of partner engagement.</p> <p><b>Transfer:</b> all parties accept responsibility and mutual accountability.</p>

## Data and Privacy

The quality of the information received from service providers is incomplete or inaccurate resulting in data that cannot be trusted and reduced confidence and uptake of the services.	The quality of the information received from service providers is incomplete or inaccurate resulting in data that cannot be trusted and reduced confidence and uptake of the services.	3	4	16	<p><b>Avoid:</b> user interface must be clear and easy and intuitive for the service providers and must not require extensive additional work.</p> <p><b>Avoid:</b> well defined onboarding and orientation processes including ongoing training for data entry.</p> <p><b>Avoid:</b> automated systems that identify inconsistent or inaccurate data</p> <p><b>Avoid:</b> ongoing feedback that identifies inaccurate data.</p> <p><b>Avoid:</b> regular data review by the governance/ ops team.</p> <p><b>Avoid:</b> clear requirements/screening for service providers as a part of onboarding.</p> <p><b>Avoid:</b> as the service providers become more proficient with and see the benefits of the system they will self-manage.</p> <p><b>Accept:</b> some data inconsistency is inevitable and processes must be identified to compensate.</p>
CBOs and institutional partners may fear that information shared could be used against participants or accessed by people they do not trust. For example, an organization's processes or areas of improvement could be shared with a key funder.	CBOs and institutional partners may fear that information shared could be used against participants or accessed by people they do not trust. For example, an organization's processes or areas of improvement could be shared with a key funder. This would result in reticence to onboard, reducing the services available, and ultimately, adoption.	3	3	12	<p><b>Avoid:</b> Clearly identify who has authority over the data that is shared and collected. Do not collect personally identifiable data. Confidentiality agreements as a part of the Data Sharing Agreement to provide peace of mind to participants, as appropriate.</p>
If we provide free Wi-Fi to a neighbourhood, this could be used to gain access to the devices of users of the system.	Public Wi-Fi has a reputation of providing access to allow hackers access to our devices. Providing individuals in some neighbourhoods with free public Wi-Fi might expose them to hacking, resulting in an invasion of privacy and potential loss of information, in turn resulting in potential harm to our citizens and litigation.	4	1	8	<p><b>Avoid:</b> The Wi-Fi network will be built using network protocols and exposing network ports that allow HTTP and HTTPS traffic only. We may potentially limit this to only HTTPS traffic. Therefore, this is limited to Internet browsing only, and does not expose users to other Internet protocols, which limits the exposure.</p> <p><b>Transfer:</b> This is a service that we will likely partner with another organization to provide – potentially Shaw or SaskTel. We would then have the established network monitoring and control infrastructure of that service provider to address this risk.</p> <p><b>Reduce:</b> We will have network monitoring in place that detects behavior that reflects a systemic attack on network components, and alerts IT Operations staff.</p>

## Finance

The greatest source of cost is in the technology that will provide the front-end and back-end solution where we have been able to give only high level estimates of cost. This may result in a solution that is not as developed as we currently plan.	The greatest source of cost is in the technology that will provide the front-end and back-end solution where we have been able to give only high-level estimates of cost. Our approach will be to balance development of front-end and back-end to provide a system that is usable as soon as we can with the funding available. Given the uncertainty of costs, current funding may take us to a point that is not as fully developed as we currently plan. This could result in reduced onboarding of partners and CBOs, and in reduced adoption by end users.	3	4	16	<p><b>Avoid:</b> More granular planning will allow us to optimize technology spending to arrive at an optimal solution.</p> <p><b>Reduce:</b> The need to spend additionally on technology will enable program governance to seek additional contributions for funding of the program.</p>
Operational funding is not secured to sustain the program after the period of the Smart Cities Challenge funding, resulting in a failure of the program to meet its long-term objectives.	The program does not attract sufficient funding to allow it to continue after the Smart Cities Challenge period.	4	1	8	<p><b>Avoid:</b> Early identification and engagement with future funding partners will ensure operational continuity of ConnectYXE, through and after the period of Smart Cities Challenge funding.</p>

## Implementation Phase Requirements

There is a risk we are unable to attract and/or retain Indigenous people to fill the key positions for ConnectYXE.	ConnectYXE is designed to address the needs of Indigenous youth, families and allies. We plan for significant participation from Indigenous youth or Indigenous peoples to better reflect the perspective and needs of this community as the program is developed and delivered. There is a risk that we will not be able to attract Indigenous peoples to the executive roles (Program Manager, Technical Director, Administrator or Program Coordinator), or to keep individuals in these roles.	3	4	16	<p><b>Avoid:</b> The approach to procuring staff provides for weighting of results for individuals who are from CEB identified groups, with a focus on representation from Indigenous Peoples.</p> <p><b>Transfer:</b> We will work with community allies, asking them for help in identifying Indigenous candidates for program roles, and for help in encouraging those individuals to apply.</p> <p><b>Reduce:</b> We will create incentives to support individuals who apply for roles that are new to them, including opportunities for mentorship and training in these new roles.</p> <p><b>Accept:</b> We will aspire to fill executive roles with Indigenous peoples, but accept that we may have to fill program roles with other CEB target groups in order to keep the program moving forward.</p>
There is a risk that suppliers and/or contractors who at the outset commit to setting CEB targets are unable to meet those targets, resulting in reduced engagement from CEB target groups, a narrower vision, and reduced adoption.	There is a risk that suppliers and/or contractors, who at the outset, commit to setting CEB targets and are unable to meet those targets, resulting in reduced engagement from the groups identified for this initiative, a narrower vision, and potentially reduced adoption.	2	3	6	<p><b>Transfer:</b> Continue to advocate to our contractors and suppliers the benefits of incorporating diverse voices, and our desire to deal with those who do.</p> <p><b>Reduce:</b> require annual monitoring and reporting out on hours related to employment and/or procurement opportunities of identified target groups</p>
Perceived insufficient Indigenous leadership in this project, a project team that is not representative and has no lived reality. May reduce adoption of the service.	Perceived insufficient Indigenous leadership in this project, a project team that is not representative and has no lived reality. This may reduce adoption of the service or negative publicity.	1	2	2	<p><b>Avoid:</b> Communications will clearly spell out the process and the governance used.</p> <p><b>Transfer:</b> Engage with CBOs and partners to communicate the process</p>

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## 11.5 Appendix Five: Letters of Support

ConnectYXE has broad support of the community and from our institutional partners. We include letters indicating that support from:

- Central Urban Metis Federation Inc.
- City of Saskatoon, Office of the Mayor
- Greater Saskatoon Catholic Schools
- Saskatchewan Health Authority
- Saskatchewan Indian Institute of Technologies
- Saskatchewan Polytechnic
- Saskatoon Police Service
- Saskatoon Public School Division
- Saskatoon Tribal Council
- United Way of Saskatoon and area
- University of Saskatchewan



**Central Urban Métis Federation Inc.**  
**315 Avenue M South**  
**Saskatoon, SK S7M 2K5**  
**Tel: (306) 975-9999 Fax: (306) 975-9156**

January 8, 2019

**RE: Letter of Support – Smart Cities Challenge**

On behalf of Central Urban Metis Federation Inc. (CUMFI), I am pleased to provide a letter of Support to the City of Saskatoon with respect to the Smart Cities Challenge. I believe that Saskatoon Smart Cities Challenge Statement, “to be the city that breaks the cycle of Indigenous Youth Incarcerations through innovative and integrated supports that provide purpose, belonging and security”, tailors well with our mandate at CUMFI. Over, the past year, Saskatoon’s Smart Cities challenge has made leaps and bounds with the inclusion of all partners, including youth. We are proud to be a part of this innovative strategy.

CUMFI was incorporated in 1993, by a group of Métis people living in the City of Saskatoon. Our mandate is: the promotion of the heritage, cultural, economic, educational and social well-being of the Indigenous community in Saskatoon. CUMFI is non-profit charitable organization, with nearly 6000 registered members. We are considered one of the leading Aboriginal Supported Housing and Wellness Community Organizations in Saskatoon, Saskatchewan. With properties throughout the Saskatoon Core Neighborhood. We provide vital supports for the disenfranchised and vulnerable populations while also providing affordable living for those in need. CUMFI’s focus has always been and continues to be on women and children, youth and families. Our programs serve the Metis community; however, all of the programming is status blind.

CUMFI has demonstrated to its members, community and stakeholders the professionalism and capability to successfully deliver preventative, intervention and advocacy support programs and services to the urban Indigenous people of Saskatoon. We continue to develop collaborative partnerships with various agencies and support groups to avoid duplication of program and service delivery. CUMFI works with all social issues in the core areas of Saskatoon inclusive of Homelessness, Addictions, Counselling, HIV/AIDS, Fetal Alcohol Spectrum Disorder, Mental health, Fostering Families/shelters and programs, Elder Care, Children’s Group homes, Youth Justice, and Community Gatherings, and has many partnerships and participates on various committees.

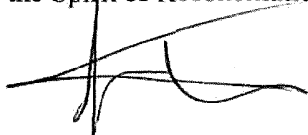
Indigenous youth in Canada are incarcerated at rates that are six times greater than their non-Indigenous counterparts. Studies have attributed this disparity to several factors: the

intergenerational effect of colonial policies for assimilation; racial discrimination, both by the policy and Canadian society at large; the lingering effects of residential school experiences; low educational levels; and few employment opportunities. In Saskatchewan, the rates of Indigenous youth are staggering, research has indicated that the rate of incarceration for Aboriginal youth in Saskatchewan is 30 times higher than that of non-Aboriginal youth. CUMFI is working towards a youth healing facility that addresses issues like the use of Crystal Meth and other substances that has a direct correlation to Indigenous Youth incarceration rates.

The City of Saskatoon has been a leader in reconciliation and social development. CUMFI has worked closely with the City of Saskatoon since 1993, and we fully support the Administration in this very important endeavor. We believe that working together with the City of Saskatoon and the Smart Cities Challenge, will have a dramatic impact on decreasing the number of Indigenous Youth Incarcerated. We look forward to our continued strong relationship with the City of Saskatoon in addressing this very serious issue. It is with pleasure that I submit this letter support for Saskatoon, Smart Cities Challenge application.

If you require further information or clarification please do not hesitate to call me at (306) 222-5527.

In the Spirit of Reconciliation,



**Shirley Isbister**  
**President**  
**Central Urban Métis Federation (1993) Inc.**



## OFFICE OF THE MAYOR

March 4, 2019

To: Smart Cities Challenge Jury

The City of Saskatoon is very proud of the work our Smart Cities team has accomplished over the past year in developing our proposal: To be the city that breaks the cycle of Indigenous youth incarceration by creating a new cycle focused on building purpose, belonging, security and identity. This required building authentic and committed relationships with and among many individuals and groups - including Indigenous youth, community-based organizations, and institutional partners.

The sense of ownership and collective learning that has been developed in this process over the past year has had a significant and positive impact on how we understand the challenges for both the youth in our city and youth service providers. This knowledge will benefit us all in how we continue to work together and on related issues in the future. We are very thankful for the opportunity to have been a part of this challenge. The City of Saskatoon is fully committed to this proposal. We will be the lead contract agreement holder with Infrastructure Canada and a key partner for the ConnectYXE program. In-kind commitments we have made in the proposal include:

Staff time - from support provided by our Community Development Managers to Technology Project Management to Solicitors, Human Resources and Procurement support;  
Access to City services such as leisure centres and transit access.

If we can make a difference through ConnectYXE in improving the access to programs and services for Indigenous youth, our entire city benefits. We look forward to working with our community on this program.

Sincerely,

**Charlie Clark**  
Mayor

222 - 3<sup>rd</sup> Avenue North, Saskatoon, SK Canada S7K 0J5 • Phone (306) 975-3202 • [www.saskatoon.ca](http://www.saskatoon.ca)

January 25, 2019

**RE: Letter of Support – City of Saskatoon Application**

To: Smart Cities Challenge Adjudication Committee Members

Simple solutions applied to complex problems rarely result in reducing the impact of the problem. This is truer now than ever, particularly when we tackle a complex issue such as indigenous youth incarceration rates.

In establishing an effective solution to this issue, a variety of stakeholders is required along with a core planner and some unique resources. Breaking a cycle requires that these unique resources need to include disruptive innovations. In recent years, these 'disruptive innovations' tend to have come through emerging technologies. However, developing these innovations often takes extraordinary resources and collaboration.

All of the necessary elements are in place here in Saskatoon and we are poised to act. We are ready thanks to; a) the core planning role enlivened by the City of Saskatoon, b) the extraordinary resource possibility from the Government of Canada, c) the variety of stakeholders at the table that bring their expertise, influence and commitment to this plan, and d) the disruptive innovations that technology may provide. We are well positioned.

On behalf of Greater Saskatoon Catholic Schools, please accept this letter of support and commitment to the Smart Cities Challenge. We are one stakeholder that certainly has an important role to play. We are honoured to serve each day many thousands of youth in our city. We currently provide many unique and innovative supports and programs designed to support our indigenous students and families: our Pre-K – Grade 8 Cree Bilingual Program, our Indigenous Language and Fitness Program, our involvement at White Buffalo Youth Lodge to name but a very few. We are involved in the transitions for our youth – particularly as they move into the work force. We have many career education opportunities as well as community connections. As we look at the four pillars of the project (purpose, belonging, security and identity), we have a stake and role to play in all four. Of most significance would be the actions of:  
*Increasing job training and access to educational activities.*



Education is committed to this project. For our part, schools will support student access to the technological interface as well as support effective planning and delivery of the supports. We have a good deal of internal work happening with the goal of increasing First Nations' students' educational outcomes. We are excited by the possibilities that this project holds to further support our youth.

Any complex, community solution requires multiple stakeholders to participate. Fortunately, at this table, we have the other partners that also have a role to play. As we target a disruptive innovation at this challenge, we have the necessary members of the community to bring it to fruition. This type of work is very invigorating and has many other spinoff effects that lead to greater collaboration amongst sectors independent of the project in this case.

In conclusion, Greater Saskatoon Catholic Schools appreciates this opportunity afforded to the community by the Government of Canada through this grant. As well, thanks to the City of Saskatoon for initiating this application. We look forward to a favourable determination and the exciting positive impacts this would have in our community.

Sincerely,

A handwritten signature in black ink, appearing to read "G. Chatlain".

Greg Chatlain  
Director of Education/CEO



February 1, 2019

To the Smart Cities Challenge Review Team:

We are pleased to provide this letter of support from the Saskatchewan Health Authority for the City of Saskatoon's Smart Cities Challenge application.

The Saskatchewan Health Authority provides a comprehensive set of health services across the province with a goal of ensuring patients receive high quality, timely health care, wherever they live in Saskatchewan. In the City of Saskatoon, services provided by the portfolios of Primary Health Care and Mental Health and Addictions as well as a Ministry of Health strategy aimed at "Connected care for the people of Saskatchewan" have touchpoints with the City of Saskatoon's Challenge Statement:

**"To be the city that breaks the cycle of Indigenous youth incarceration by creating a new cycle focused on building purpose, belonging and security."**

We are committed to improving mental health services as well as addressing root causes that lead to and/or exacerbate mental health problems, and can result in children and youth engaging in risky, criminal activity. A number of our initiatives complement the work indicated through the Challenge Statement, such as:

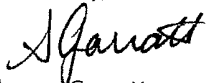
- A focus on increasing culturally sensitive practices, cultural adaptations to programming and enhancing the cultural competency of our workforce to address health inequities experienced within Indigenous populations. In addition to this, trauma-informed care is being explored as a principle of practice that helps people (clients as well as health care providers) understand and improve coping responses to the impact of racism, poverty, childhood trauma and more.
- Work within Population and Public Health, such as recreational settings and housing inspection and enforcement, prioritizes the need and response based on social determinants of health. Interventions are prioritized in areas of high social and material deprivation based on findings from mapping the neighbourhood deprivation index.
- Engagement in intersectoral poverty reduction efforts with both a provincial and municipal focus. Currently Population and Public Health is collaborating with community partners and the City of Saskatoon to create a Municipal Poverty Reduction Plan. Poverty is a condition that tends to impact our Indigenous communities more intensely and evidence links it to an increased risk of children and youth engagement in criminal activities.
- The Health and Education Partnership with school divisions (includes Population and Public Health, Mental Health and Addictions, and Primary Health and Chronic Disease Management) that includes a focus on Reconciliation and improving health equity outcomes of Indigenous children and youth.

Page | 1

- Connected Community Care focusing on providing intermediate community-based care for complex needs clients. The aim is to create a centre of excellence for the care of the target population. There is a Community Health Centre planned at Market Mall focusing on older adults, with further investments to focus on the complex needs of residents that live in the 5 core neighbourhoods and Downtown Central Business District.
- Partnership agreements to improve the health outcomes for First Nations populations created with the Saskatoon Tribal Council and Whitecap Dakota First Nation. This works to ensure that activities will improve the health status of First Nations' people through diverse, but targeted initiatives honors protocols to provide culturally sensitive and appropriate care.

As health care leaders, and on behalf of the practitioners involved in this work, we are excited about the opportunity to further partner with the City of Saskatoon on this intersectoral initiative. It has large-scale potential to positively impact the community well-being and safety of Saskatoon residents and reduce health inequities in our community. Please feel free to contact us if you require additional information.


Sincerely,



Sharon Garratt  
Vice President & Chief Nursing Officer  
Integrated Urban Health



Julie Kryzanowski  
Senior Medical Health Officer  
Quality, Safety & Strategy



Dr. Mark Wahba  
Physician Executive  
Integrated Urban Health



SASKATCHEWAN  
INDIAN  
INSTITUTE OF  
TECHNOLOGIES

April 20, 2018

Office of the President

118 - 335 Packham Ave.  
Saskatoon, SK S7N 4S1

Phone: 306-244-4444  
Toll Free: 1-800-667-9704  
Fax: 306-244-1391

Web Site: [www.siiit.sk.ca](http://www.siiit.sk.ca)

To Whom it May Concern,

As part of an ongoing partnership with the City of Saskatoon, the Saskatchewan Indian Institute of Technologies is pleased to provide support in the Infrastructure Canada Smart Cities Challenge. We endorse the following challenge statement: *To be the city that breaks the cycle of Indigenous youth incarceration by creating a new cycle focused on building purpose, belonging, security and identity.*

In support of the four pillars outlined in the City's preliminary application, we are able to support the initiative in the following ways:

**Purpose, Security, Belonging, and Identity-** SIIT will provide campus tours to youth from Saskatoon Tribal Council, Saskatoon Catholic and Public School Systems, engaging them in career exploration and post-secondary options with our lifelong learning community. In this context, youth will have the opportunity to network with Indigenous staff and students from diverse backgrounds, studying and working in a variety of fields. These tours will also provide exposure opportunities with a variety of simulation technologies, including welding and aircraft simulators.

Additionally, SIIT will make work integrated learning connections between the City of Saskatoon and SIIT students participating in Mental Health and Wellness and Educational Assistant programs. These specialized Indigenous professionals will provide mentorship to Indigenous youth participating in school and recreational programming in and surrounding the city.

There are also opportunities to integrate ABE and essential skills programs into inner city, community schools - such as St. Mary's and Pleasant Hill - as done previously and with great success.

Finally, the White Buffalo Youth Lodge - and additional partnership with the Saskatoon Tribal Council - will add an additional forum to engage youth with programs, services, and mentorship available through the City of Saskatoon and the Saskatchewan Indian Institute of Technologies.

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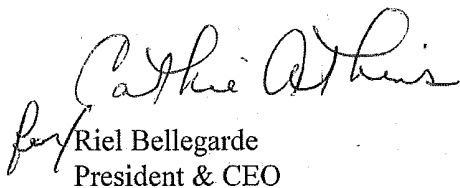


Page 2  
April 20, 2018

Please accept this letter supporting the development and delivery of the City of Saskatoon's Smart Cities preliminary application. We look forward to participating in this initiative with Infrastructure Canada and a successful submission.

Sincerely,

SASKATCHEWAN INDIAN  
INSTITUTE OF TECHNOLOGIES

  
Riel Bellegarde  
President & CEO

sk



February 12, 2019

Smart Cities Challenge  
Infrastructure Canada  
Ottawa, ON

Dear Application Jury:

**Re: Letter of Support for the City of Saskatoon Smart Cities Challenge Application**

As the President and CEO of Saskatchewan Polytechnic, I am happy to express our enthusiastic support for the Smart Cities Challenge application, being submitted by the City of Saskatoon. Our institution is the primary source of technical education in Saskatchewan, providing applied learning opportunities from our four campuses across the Province, as well as through extensive distance education programming. The Saskatoon Campus is our most active one, providing responsive applied education opportunities through certificate, diploma, and degree programs, as well as through apprenticeship training that meets student, employer, and market needs in Saskatoon, the Province of Saskatchewan and across Canada.

The Challenge being undertaken by the City of Saskatoon is one to which Saskatchewan Polytechnic is fully committed. As a recognized national leader in the areas of Indigenous learning and student support, Saskatchewan Polytechnic provides education to over 3,600 Indigenous students each year, and we are steadfastly working at continuing to increase that number. It is our belief that education is a key component to breaking the existing cycle of Indigenous youth incarceration, and we will continue to work with the City of Saskatoon to make that happen.

Saskatchewan Polytechnic will be supporting the achievement of the Challenge Statement in a number of ways. As an Institutional Partner in this initiative, we will play a role in the governance structure of the program, and will be providing our input at every opportunity. In addition, the involvement of our Digital Integration Centre of Excellence (DICE) will be continued. Our researchers within DICE have a strong background in big data, the Internet of Things and machine learning. From the outset they have been an integral part of the technical group gathered by the City of Saskatoon, and DICE will continue to provide direction and support to the rollout of technical supports for Indigenous youth at risk in Saskatoon. We foresee that our expertise will be a valuable boost in the engagement of transportation tracking technology, data analysis, mobile app development and wellness software. Many of these areas are already the subject of research being done by our faculty and research specialists, together with Saskatchewan Polytechnic students who work on capstone research projects with local not-for-profit groups.

Administrative Offices  
400-119 4<sup>th</sup> Avenue South, Saskatoon SK S7K 5X2

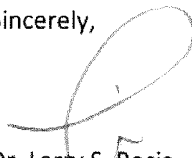
Our Indigenous Strategy group will also remain involved in advancing the goals that the City of Saskatoon is pursuing. Our Indigenous Strategy Director and his team have been active as part of the community group that are developing solutions to the problems that Indigenous youth face. The Sask Polytech Indigenous Strategy Group is a leader in supporting Indigenous post-secondary education, and they are approached regularly by institutions from across Canada, to provide best practice advice on addressing Indigenous needs. They are closely connected with Indigenous groups from across Saskatchewan, working to ensure that Indigenous students are supported in their efforts to advance their education.

Saskatchewan Polytechnic has existing programming which is geared toward the needs of Indigenous youth in Saskatoon. Our Adult Literacy program is an example of the type of course which gives students the tools they need to advance their education. We have Counsellors and Career Assessment Specialists who work with youth to help them make informed and effective decisions about their futures. Our Saskatoon Campus has the potential to provide access to Indigenous elders and ceremonies, which has been found to be a strong support for youth.

As an institution, we see ourselves as being a strong part of the process to improve the future of Indigenous youth in Saskatoon, by providing guidance and programming that will help prepare them to succeed. During a recent ceremony to celebrate the renewal of our Indigenous Success Strategy, one of the elders on our Saskatoon Campus summed up by saying that to her, "Education is the new buffalo. The most powerful educations enable learners to embrace lessons from the past and reconcile those lessons with contemporary circumstances, skills, tools and knowledge." As an institution, Saskatchewan Polytechnic, its faculty and employees believe that statement, and we will continue to support it in every way that we can.

In closing, Saskatchewan Polytechnic strongly confirms its support for the City of Saskatoon's application to the Smart Cities Challenge. We are committed to the success of the proposal and look forward to participating in its implementation.

Sincerely,



Dr. Larry S. Rosia  
President and CEO



April 18, 2018

**Re: Letter of Support for Smart Cities Challenge**

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The Saskatoon Police Service is excited to participate in the Smart Cities Challenge and has teamed up with other institutional partners in an effort to improve the quality of lives for the citizens of Saskatoon. Saskatoon City Council provided direction that our challenge should be related to community safety and wellbeing and any challenge statement should be a social/human centered one. With that framework, the institutional partners are excited and have created the following challenge statement: *"To be the city that breaks the cycle of indigenous youth incarceration by creating a new cycle focused on building purpose, belonging, security and identity."*

Although the primary function of the police is preservation of the peace, public safety and enforcement of laws, we believe the statement is true that "it takes a community to raise a child". As such, the Police Service manages and/or participates in numerous proactive prevention programs aimed at children and youth in our city including the following:

- Partner in the Strengthening Families Saskatoon Program which is an inter-agency collaborative effort working with the family unit toward the reduction of risk factors for problem behaviors in high-risk children;
- Partner in the Hub program working with agencies to better coordinate the services they provide to result in better health, safety and welfare of high risk individuals and families;
- Administer the Crime Free Multi-Housing program which introduces crime prevention techniques to multi-housing properties and is designed to reduce crime in rental properties;
- Partner in the SPS Cadet Orientation Police Studies Program (C.O.P.S.) that provides students a credit for successful completion and exposes the grade 11 and 12 students to the duties and responsibilities of a police officer while building stronger relationships with youth and bridging ethnic and socioeconomic gaps within the community;
- Partner in Drug Awareness and Healthy Lifestyles Days, an event designed to promote healthy lifestyle choices among youth;

76 - 25TH STREET E • BOX 1728 • SASKATOON, SK S7K 3R6 • (306) 975-8300

*Honour - Spirit - Vision*



- SPS Peacekeeper Cadet Program for Grades 4 to 8 students designed to provide Cadets with structure, discipline, goal setting, leadership, community involvement, the desire to stay in school and participate in organized sports;
- SPS High School Showcase – SPS Trade show – Grades 10 to 12;
- SPS Police and Student Sports Program (P.A.S.S.) – police playing floor hockey and volleyball with inner city youth;
- SPS Youth Advisory Committee – youth committee working with the Cultural Resource Unit to identify and target barriers between police and youth;
- Partner in Saskatoon Restorative Action Program (RAP), working with youth in high schools to encourage engagement in creating respectful and safe communities;
- Alternative Measures Program (AMP) – alternatives for minor criminal offences committed;
- SPS Kids and Cops – Summer programs (July and August) for sport, leadership, and recreation;
- Cultural Unit engages inner city children at spray parks and paddling pools – breaking down barriers and talking with kids and their families in the summer months;
- Duke of Edinburgh Award Program – building youth skills to provide life leadership.

Another strength and contribution the Police Service can make is access to and use of our data. We have an Analytics Lab with extensive IT support.

Finally, our organization is very focused on inclusion and reconciliation. We can offer support for programs aimed at developing a sense of cultural identity.

Yours truly,



Troy Cooper, M.O.M. MBA  
**Chief of Police**  
 /clt



**Saskatoon Public Schools**  
Inspiring Learning

310 - 21st Street East, Saskatoon SK S7K 1M7  
Tel: (306) 683.8200 Fax: (306) 657.3900  
saskatoonpublicschools.ca  
Barry MacDougall, Director of Education

February 4, 2019

To whom it may concern,

On behalf of Saskatoon Public Schools, I write to express our support as an institutional partner for the City of Saskatoon's submission for the Smart Cities Challenge.

With more than 25,000 students, our school division is the largest in Saskatchewan. Located on Treaty 6 territory, the traditional territory of the Cree and Dakota people and the homeland of the Métis Nation, Saskatoon Public Schools believes in lifting up our Indigenous learners. Our school division has a responsibility to serve not only the Indigenous families in our community, but share the history, cultural understandings, and traditional teachings of the First Nations and Métis with all our students.

This aligns with the City's challenge to focus on building purpose, belonging, security and identity in Indigenous youth. As an educational institution, we know that meeting the City's challenge is not possible without education. To build a sense of purpose, youth must have an opportunity to explore career possibilities and find their passion. To feel a sense of belonging, youth must believe they are seen, heard, and included in their school community. A sense of security can come from the support system that school staff and community partners provide, connecting our youth and their families to the services they need. Above all, we know identity is key to student success. Indigenous youth must see themselves reflected in their learning.

Public education is foundational to the success of society. While the betterment of oneself can lead to the betterment of the community, it is incumbent upon the community to first stand up for its individual members. We recognize the potential our indigenous youth hold but they cannot do this alone; we must provide equitable opportunities for all to succeed.

Our school division stands with the City of Saskatoon and its collective partners to rise to this challenge.

Sincerely,

Mr. Barry MacDougall, Director of Education, Saskatoon Public Schools

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## SASKATOON TRIBAL COUNCIL

ASIMAKANISEKAN ASKIY RESERVE # 102A

200 – 335 Packham Avenue  
Saskatoon, Saskatchewan S7N 4S1  
Phone (306) 956-6100 Fax (306) 244-7273



Office of the Tribal Chief

March 1, 2019

To Whom it May Concern

Re: City of Saskatoon Smart Cities Challenge Letter of Support

The Saskatoon Tribal Council has been a proud partner with the City of Saskatoon on many initiatives that address the social issues that Indigenous residents of Saskatoon face on a daily basis. The Smart Cities Challenge is a bold and much needed issue that we are proud to again be working with this city to solve. **"To be the city that breaks the cycle of Indigenous youth incarceration by creating a new cycle focused on building purpose, belonging, security and identity."**

This proposal will play an important part in reducing social and economic barriers faced by First Nations people in Saskatoon. We support all parts of bringing the ConnectYXE program to Saskatoon:

**Data Hub:** We are involved in providing services and programs to Indigenous youth and will provide the relevant data for the Data Hub that enable the youth and their families to know what programs and services are available to them.

**Access to Program and Service Information:** The information will be accessed through interfaces such as websites, smart screens and public kiosks. We will ensure that we support access to those interfaces as much as possible: we will provide a link to the ConnectYXE website where relevant, we will host kiosks in our program facilities, and we will look for other opportunities to let youth and their families find out about the services available in our city.

**Collaboration:** We will continue to have our staff participate in the ConnectYXE meetings and working groups as a way to contribute to the city-wide collaboration that has been strengthened in the process of developing ConnectYXE.

As a First Nations organization and partner, we have been very pleased with the outcome and results of past and current initiatives with the City of Saskatoon. ConnectYXE will have a real impact on the Indigenous community in Saskatoon and we are proud to continue to be a partner on this important initiative.

Please don't hesitate to contact me at (306) 280-5394 if you have any questions. Thank you.

Sincerely,

Tribal Chief Mark Arcand  
Saskatoon Tribal Council

Kinistin    Mistawasis    Muskeg Lake    Muskoday    One Arrow    Whitecap Dakota    Yellow Quill

Smart Cities Challenge | Saskatoon

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February 5, 2019

TO WHOM IT MAY CONCERN:

Re: Smart Cities Challenge

At United Way of Saskatoon & Area, we make it our priority to help build strong communities. A few of the ways we achieve this is by providing funding to organizations that focus on mental, physical and spiritual well-being, and as a community mobilizer. We have enjoyed a long and productive partnership with the City of Saskatoon in a variety of capacities, including leading projects that focus on improving the lives of Indigenous youth.

Over the last year, the City of Saskatoon has done a fantastic job of bringing together disparate community stakeholders around the Smart Cities vision; a testament to the trust our community has in its ability to lead. The foresight to include Indigenous youth with lived experience to help lead this initiative will be critical to the success of our Smart Cities initiative.

We have been a strong supporter from the beginning, understanding that our Indigenous community faces unique challenges which require unique, long term, and sustainable approaches. Our role in the Smart Cities Challenge has grown to serve two functions, as part of the institutional partners' governance committee and data and technology sharing through our 211 Saskatchewan service.

We look forward to continuing to invest our time and resources to ensure that together, Saskatoon will reduce Indigenous youth incarceration rates.

Sincerely,

A handwritten signature in black ink, appearing to read "Shaun Dyer". The signature is fluid and cursive, with the first name "Shaun" being more prominent.

Shaun Dyer  
CEO, United Way of Saskatoon and Area

United Way of Saskatoon & Area  
100-506 25th Street East, Saskatoon, SK S7K 4A7  
P : 306-975-7700 | F : 306-244-0583 | E : office@unitedwaysaskatoon.ca  
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February, 2<sup>nd</sup>, 2019

Infrastructure Canada  
180 Kent Street  
Suite 1100  
Ottawa, Ontario K1P 0B6

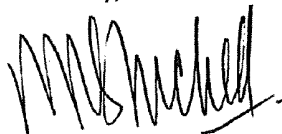
Re: Letter of Support, Smart Cities Challenge

The University of Saskatchewan is a proud partner of the City of Saskatoon and other key stakeholders in the Smart Cities Challenge competition. Throughout the last year, we have worked with the Smart Cities Saskatoon Committee to focus on our challenge, "To be the city that breaks the cycle of Indigenous youth incarceration by creating a new cycle focused on building purpose, belonging, security and identity". This goal aligns well with the University's mission of community engagement and its commitment to reconciliation efforts here and across the country.

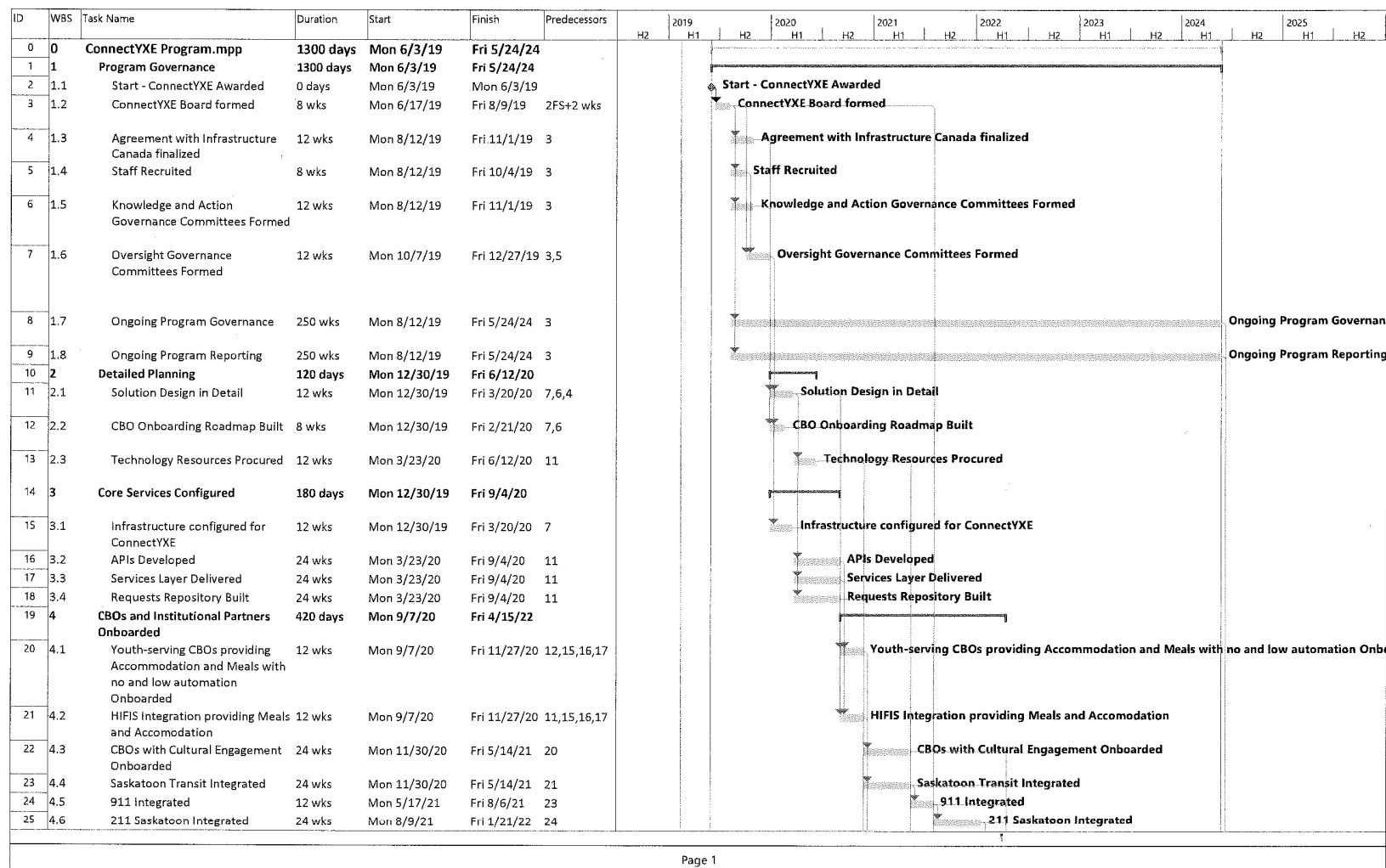
The University sees itself playing a prominent support role with the project, providing the City access to new and existing research and data to assist in designing solutions for the challenge statement. As well we will continue to ensure the project leaders have access to our students, faculty, and staff who can assist in obtaining the outcomes of the project.

We are proud to be considered a key partner in creating a change for the better in the City of Saskatoon. Thank you for the opportunity to show our support for this transformative initiative.

Sincerely,



Peter Stoicheff  
President and Vice-Chancellor



## 11.6 Appendix Six: Detailed Gantt

